ANEURYSM
OF THE
ABDOMINAL AORTA

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SL 616.136-007.64

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BEING

A Dissertation for the Degree of Doctor
of Medicine in the University
of Oxford.

BY

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1906

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PREFACE

WITH the exception of the series of cases treated at St. George's Hospital and the statistics obtained therefrom, the following pages contain little or nothing that is new. I trust, however, that the addition of another series of statistics to the literature already published may be of some use to those interested in the subject.

I wish to express my gratitude to Dr. H. D. Rolleston for his kindly and invaluable suggestions, and to Professor William Osler (without whose encouragement I should have hesitated to publish this paper) for information concerning the cases treated at the Johns Hopkins Hospital. I have also to acknowledge my indebtedness to those members of the staff of St. George's Hospital who have kindly permitted me to make use of their cases.

F. P. N.

LONDON,
June, 1906.

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ANEURYSM
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PART I.

THERE is, probably, no morbid condition of equal rarity, which has escaped diagnosis more frequently than aneurysm of the abdominal aorta ; for not only are the symptoms very often obscure, but also the very rarity of the disease causes it to be diagnosed with reluctance. But, while it is certain that the condition, when present, has frequently escaped recognition, it is equally true that it has often been diagnosed when absent. For this reason, those cases only, which have been examined after death, are admissible for statistical purposes. The object of this paper is to consider the thirty-two cases of aneurysm of the abdominal aorta which have occurred in the series of 17,872 post-mortem examinations made at St. George's Hospital between January 1, 1841, and November 30, 1905, and to compare them with the cases recorded by other writers.

It has been stated that we owe to Vesalius the first clinical description of aneurysm of the abdominal aorta.[1]

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[1] Osler, *Lancet*, October 14, 1905.

The earliest record of a case, examined after death, is attributed to Fallopius (1523-1562), a contemporary of Vesalius :

'A certain old woman, who had been afflicted for a long time with varying pains in the abdomen, and divers other symptoms, at length died. The body was examined, and an aneurysm of the abdominal aorta, much larger than a fist, was discovered. The wall of the artery exhibited such great hardness that it seemed to be ossified.'[1]

Two cases are attributed to Ballonius (1538-1616) :

1. 'A certain man was troubled with difficulty in passing his water, which difficulty sometimes amounted to actual retention of urine. The disease progressed, with occasional remissions, till at length the man died suddenly. The body was examined, and a ruptured aneurysm of the portion of the aorta below the renal vessels was discovered.'[2]

2. 'A certain man suffered from the most terrible pain in his dorsal spine for three whole years. Syphilis was suspected, and he had often been treated with mercury, but without benefit. At length he was killed by the bursting forth, both from above and below, of an enormous quantity of blood.' The body was examined after death. An aneurysm of the abdominal aorta was found lying upon the spine, and situated at the division of the vessel into the iliac arteries.[3]

Bontius (1592-16—) records the following case :

A Dutchman had suffered for three years from 'a strange and unaccountable disorder.' There was marked pulsation above the umbilicus, which Bontius describes as resembling 'the leaping of a child in the womb near the time of birth.' Bontius discovered that the pulsation was synchronous with that of the radial artery, and came to the conclusion that the 'great artery was affected.'

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[1] Lieutaud, 'Hist. Anat. Méd.,' Paris, 1757.

[2] *Ibid.*

[3] *Ibid.*

The man died on September 7, 1629, and Bontius examined the body. He found that the abdominal aorta was enlarged to twice its usual size, and was filled with black blood and clot. The man also had an enormous liver and a very large and flabby heart.[1]

Fantonus (1675-1758) describes a case :

'The patient, a stone-mason by occupation, had suffered for a long time from attacks of faintness and from pain in the abdomen and genitals. He became feverish, with hard pulse and turbid urine, and eventually died. The body was examined, and a large aneurysm, arising from the abdominal aorta a short distance above the bifurcation, was discovered. The sac had ruptured, and the blood had passed between the layers of the mesentery, and also lay in great quantity round the kidneys.'[2]

Morgagni records two cases :

1. 'An old man, who was believed to have contracted syphilis earlier in life, had been in hospital for many days, complaining of everything except those symptoms which are associated with syphilis or aneurysm of the aorta. He did not suffer from pain, sensation of weight, or dyspnœa. He died in December, 1718, soon after he had finished his dinner.'

The body was examined, and the suspicions as to old syphilitic disease were confirmed. In the abdomen, a large aneurysm of the aorta was found. The sac was crescent-shaped, having its convexity closely applied to the under surface of the diaphragm, while the horns pointed downwards and were concealed behind the psoas muscle.

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[1] 'Diseases, Natural History and Medicines of the East Indies,' trans., London, 1769, Obs. 8.

[2] 'Observationes Méd. et Anat.,' Obs. 1.

The sac was ‘ false ’ posteriorly. The vertebræ were eroded, but the intervertebral discs were quite uninjured. The aneurysm had ruptured through the diaphragm into the thorax.[1]

Morgagni remarks that, although the case was so obscure when he saw it, there must have been symptoms at some time, especially pain in the loins.[2]

2. ‘ A carman of Padua fell down, and the wheel of a cart passed over his abdomen. He had up to that time been healthy, saving that he had contracted syphilis; but, after the accident, he was seized with severe pain in the back and loins, and had to take to his bed. The case was seen by several physicians and by Valisneri, who, finding pulsation in the left lumbar region, made a diagnosis of aneurysm. He suggested such measures as would tend to prolong life, but did not attempt to cure the disease. The part afterwards swelled greatly, the tumefaction even raising the contiguous ribs, and the corresponding leg and thigh became œdematous. An unskilful surgeon, after endeavouring to produce suppuration, opened the tumour, and the man bled to death within a quarter of an hour.’

He was ill for about eight months altogether, and died on November 4, 1719.

Morgagni was present at the examination of the body. An aneurysm was found extending from the diaphragm to the pelvis. The organs were greatly displaced towards the right, so that even the left kidney lay in the umbilical region. The ribs and spine were eroded, while the intervertebral discs were absolutely intact.

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[1] ‘ Epist. Anat. Med.,’ xl. 29.

[2] *Ibid.*, xl. 30.

Morgagni remarks that they were surprised to find all the viscera free from organic lesions amid such inversion of their natural order.[1]

The foregoing cases have been quoted somewhat fully, partly on account of their historical interest, and party because of their value as illustrating the frequent difficulty of arriving at a correct diagnosis, even when the disease is far advanced.

The case attributed to Fallopius is of particular interest as affording an almost exact parallel to Case VIII. in the St. George's Hospital series.

The case described by Bontius illustrates a point of diagnostic importance, since the patient's heart was greatly enlarged, and the abdominal pulsation might have been regarded as being transmitted from the thorax.

The cases recorded by Morgagni deserve attention, on account of his observations as to the condition of the viscera in Valisneri's case, and because, as already pointed out by Osler,[2] the fact that the intervertebral discs have the power to resist erosion is, for the first time, carefully noted.

Incidence.

At present there are no means of obtaining statistics as to the general incidence, in this country, of aneurysm of the abdominal aorta; since the law does not require sufficient detail in the filling in of death certificates to enable the Registrar-General to differentiate between the various arteries affected by aneurysm. Statistics are proverbially fallacious, especially when the figures used in compiling them are small; nevertheless, the various sets of statistics bearing upon the incidence of aneurysm of the abdominal aorta, in this country, are in agreement to so great an extent that they cannot be regarded as absolutely valueless.

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[1] 'Epist. Anat. Med.,' xl. 26.

[2] *Lancet*, October 14, 1905.

1. **General Incidence.**—The figures given below are based upon the results of the post-mortem examinations made at St. George's Hospital between January 1, 1841, and November 30, 1905, and upon the results of those made at Guy's Hospital between 1854 and 1900 (inclusive).[1]

Hospital.	Post-mortem Examinations.	Aneurysms of Abdominal Aorta.	Approximate Incidence per 1.000.
St. George's.. ..	17,872	32	2
Guy's	18,678	54	3
Total	36,550	86	2

The figures set down above, when taken together, show an incidence of 2 cases per 1,000 in the 'working classes' of London and its neighbourhood, but it would appear that the incidence varies considerably in different parts of the world. In Vienna only 3 aneurysms of the abdominal aorta were found in 19,300 cases examined after death (Schrötter),[2] which gives an incidence of less than 2 in 10,000; while at the Johns Hopkins Hospital, Montreal, there were 11 cases among 2,200 examined after death[3]—an incidence of 5 per 1,000.

2. **Frequency of Occurrence of Aneurysm of the Abdominal Aorta compared with that of Aneurysm of the Thoracic Aorta.**—Under this heading, a third series

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[1] J. H. Bryant, *Clinical Journal*, November 18 and 25, 1903.

[2] Osler, *Lancet*, October 14, 1905.

[3] *Ibid.*

of cases is available. These consist of 173 cases of aneurysm of the aorta which occurred in the post-mortem examinations made at St. Bartholomew's Hospital, between 1867 and 1897, and which were published by Dr. Oswald Brown. The figures are shown in the following table :

Hospital.	Aneurysms of Abdominal Aorta.	Aneurysms of Thoracic Aorta.	Approximate Relative Frequency.
St. Bartholomew's	23	150	1 to 7
Guy's	54	271	1 to 5
St. George's.. ..	32	134	1 to 4
Total	109	555	1 to 5

[In five of the St. George's cases[1] there were aneurysms of both the thoracic and abdominal portions of the aorta.]

The above table shows a relative frequency of 1 case of aneurysm of the abdominal aorta to 5 cases of aneurysm of the thoracic aorta. This agrees fairly well with the Johns Hopkins Hospital series,[2] in which there were 11 cases of aneurysm of the abdominal to 49 of the thoracic aorta—a relative frequency of less than 1 to 4. In Crisp's collection[3] there were 54 cases[4] of aneurysm of the abdominal and 175 of the thoracic aorta, giving a relative frequency of less than 1 to 3. Crisp's cases cannot be regarded as being of much value in this connection; since his collection consisted only of cases already published, and, proportionately, the number of cases of aneurysms of the abdominal aorta published is greater than that of the thoracic aorta.

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[1] Cases III., X., XII., XXIV., XXXII.

[2] Osler, *Lancet*, October 14, 1905.

[3] 'Diseases of the Bloodvessels,' London, 1847.

[4] Crisp's conclusions are based upon 59 cases of aneurysm of the abdominal aorta *and its branches*. The figures given here and elsewhere in this paper are based upon the 54 cases of aneurysm of the abdominal aorta recorded in the table at the end of Crisp's article.

3. **Age.**—Aneurysm of the aorta has been described as a disease of the prime of life, but aneurysm of the abdominal portion of the vessel may be regarded as a disease of the early prime. In all the collections published up to the present time, the majority of cases have occurred in persons under the age of forty years. The youthful age of the St. George's cases is particularly striking, death having taken place in 16 out of 32 cases below the age of thirty-five.

The following table gives the age and sex of the St. George's cases:

25-35.		35-45.		45-55.		55-65.		65-75.		Total.	
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
15	1	8	—	4	1	—	—	2	1	29	3
16		8		5		—		3		32	

The following shows the age of the Guy's, St. Bartholomew's, and St. George's cases together:

Hospital.	Under 20.	20-30.	30-40.	40-50.	Over 50.	Total.
Guy's	2	11	23	8	10	54
St. Bartholomew's	—	1	16	5	2	24
St George's	—	8	12	9	3	32
Total	2	20	51	22	15	110

From the above it will be seen that out of 110 cases, 73 occurred below the age of forty, and that only 15 cases occurred in persons over fifty years of age. Nearly half the cases occurred between the ages of thirty and forty. In the Johns Hopkins Hospital series of 16 cases, 9 of the patients were under forty years of age.

Out of the 46 cases in Crisp's series in which the ages are given, 33 occurred below the age of forty years, and 22 of the patients were between the ages of thirty and forty.

4. **Sex.**—All the statistics available indicate that the disease is relatively very uncommon in women. Among the 32 cases of the St. George's series, only 3 occurred in female patients. The relative frequency of occurrence with regard to sex among the cases which have been quoted is as follows :

Hospital.	Males.	Females.	Total.
Guy's	49	5	54
St. Bartholomew's	22	2	24
St. George's	29	3	32
Total	100	10	110

Only about 9 per cent. of the cases, therefore, occurred in women.

In Crisp's series there were 7 women and 47 men—an incidence of nearly 13 per cent. among women.

In the Johns Hopkins Hospital series of 16 cases, there were 2 women—an incidence of more than 12 per cent.

5. **Occupation.**—That aneurysm of the aorta occurs most frequently among those who gain their livelihood by hard physical work is admitted by all authorities. In cases of aneurysm of the abdominal aorta, however, it is more probable that the initial lesion is produced by

some sudden violent effort than by continuous hard work. The latter may cause the sac to enlarge rapidly by increasing the force of the blood-stream, but is unlikely to be the first cause of the mischief.

J. H. Bryant, in referring to the influence of occupation, quotes several cases which illustrate this point well. In the St. George's series, a history of 'strain' was only obtained in two cases, but such accidents occur frequently, and are easily forgotten.

The occupations of the patients, whose cases are included in the St. George's series, were as follows: 1 organist, 1 engineer, 1 policeman, 1 marine (subsequently a stableman), 1 soldier (subsequently a labourer), 1 greengrocer, 1 butler, 1 cabdriver, 1 printer, 1 printer's reader, 1 bootmaker, 1 billiard-marker, 1 porter, 1 coal-heaver, 1 charwoman, 2 sailors, 2 carpenters, 2 gardeners, 3 labourers, 8 occupation unknown.

Crisp's list is very similar and quite as general.

The high rate of incidence of aortic aneurysm amongst soldiers, referred to by so many writers, does not seem to extend to aneurysm of the abdominal portion of the vessel. It is possible that this frequency of occurrence in the thoracic portion is due to the prevalence of syphilis in the army, and to the very careless manner in which that disease has been treated in the past.

Causes.

Aneurysm is produced by the forces of the blood stream acting upon a more or less circumscribed portion of the vessel wall whose powers of resistance have become impaired. It is obvious that, if the vessel wall becomes generally weakened, dilatation, and not aneurysm, will be the result, since all parts of the vessel wall are equally exposed to the action of the forces.

There are, then, two immediate factors in the production of aneurysm :

1. Local weakness of the vessel wall.
2. The forces of the blood-stream.

The former is all important ; since the latter, acting alone, can only produce dilatation.

Further, it is obvious that, if the above statements are true, no constitutional disease or condition can be regarded as having taken any part in the production of an aneurysm, unless definite morbid changes, due to its influence, and capable of giving rise to aneurysm, are found in the wall of the vessel affected.

1. **Local Weakness of the Vessel Wall.**—In the St. George's series atheroma was found in 21 cases, hypoplasia was found in 2 cases ; in 4 the artery was 'healthy,' and in 5 cases there was no note as to the condition of the vessel wall.

(*a*) **Atheroma.**—This condition may be fairly regarded as the commonest cause of aneurysm of the aorta, for not only has it been found in a large majority of cases, but also the morbid changes produced by it are such as would readily conduce to the formation of aneurysms.

A detailed discussion as to the pathology of atheroma does not lie within the scope of this paper. It is sufficient to say that the condition is regarded as due to various chronic intoxications, of which those caused by syphilis, gout, and alcoholism are the most important. The tendency of modern writers is to regard syphilis as the most important factor in the production of aortic aneurysm. If this theory is to be upheld, it must be proved that syphilitic intoxication is the principal cause of atheroma. So far no such proof is forthcoming, and the difficulties of obtaining reliable statistics on the subject are familiar to all. None of the collections of cases, which have been quoted in this paper, are of any value in this connection, nor do they offer any information of value as to the influence of alcoholism ; since the majority of hospital patients are subject to this condition. With regard to gout, nothing can be said ; since most of those suffering from abdominal aneurysm die before the age at which the symptoms of this disease generally become apparent.

(*b*) **Hypoplasia.**—This condition was described by Lee Dickinson, who published the only two cases on record,[1] both of which are included in the St. George's series.[2] In both cases, the heart and great vessels were much smaller than normal, and their walls were extremely thin. The lining membrane was perfectly smooth, and microscopical examination showed no degenerative changes. In both cases, there were fusiform aneurysms of the lowest $2\frac{1}{2}$ inches of the aorta, and, in both cases, one of the common iliac arteries was involved in the aneurysmal dilatation. In one of the cases,[3] there was a second aneurysm of the aorta near the origin of the renal arteries, and there were aneurysms of the superior mesenteric and left renal arteries. Nothing is known as to the causes of this condition, and there is no evidence indicating either that it is present at birth or that it is acquired later.

(*c*) **Congenital Defects in the Wall of the Artery.**—It is admitted by all authorities that many people are born into the world with defective arterial systems, and, indeed, a tendency to early arterio-sclerosis is hereditary in not a few families. Abnormalities of the heart and great vessels are by no means uncommon, and it is not unreasonable to suppose that, in the process of development, weak spots may be occasionally left in the walls of the arteries. Willet has described a case of aneurysm of the thoracic aorta occurring in a child.[1] The aneurysm was of the saccular type, and was situated at the commencement of the descending portion, above and rather to the right of the first aortic branch. It seems probable, as is suggested by Willett, that the aneurysm was formed in connection with the opening of the ductus arteriosus. In four of the St. George's cases the wall of the aorta is described as having been 'healthy.'[2] In none of these cases was there any history of injury, but one of the patients was a bootmaker, and it is possible that the wall of the artery may have been damaged by the pressure of boots, during manufacture, against his abdomen.[3] Nevertheless, it is reasonable to suppose that in three of the cases, at any rate, the aneurysms were due to some congenital defect in the wall of the artery.

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[1] *Path. Trans.*, vol. xlv., 52.

[2] Cases XXVI. and XXVII.

[3] Case XXVII.

(*d*) **Injury of Vessel Wall.**—There can be no doubt that an aneurysm of an aorta previously healthy may be produced by direct injury to the abdomen, and a number of cases have been recorded. In the St. George's series there are no cases of this kind, but that of the carman of Padua described by Morgagni[4] is a typical example.

With regard to strains and injuries of other parts of the body as causes of aneurysm of the abdominal aorta, the case is not so clear. Indeed, it is difficult to believe that a vessel so firmly supported can be seriously injured by anything short of direct violence, unless its wall has been previously weakened.[5]

In the St. George's series, there are 4 cases of this kind. In 2 the artery was atheromatous.[1] In 1 there was hypoplasia,[2] and in 1 case there is no note as to the condition of the artery.[3] In Case IV. it is doubtful whether the aneurysm was caused by the injury; since the patient died within six months of the accident, during the whole of which period he had been in bed, and the aneurysm seems to have been of old standing, and was nearly full of laminated clot.

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[1] *Path. Trans.*, vol. xliii., p. 38.

[2] Cases II., XX., XXIII., XXV.

[3] Case XXIII.

[4] *Vide* p. 4.

[5] *Vide* p. 14.

2. **Increased Blood-Pressure.**—Hypertrophy of the heart occurs in only a small proportion of cases of aneurysm of the abdominal aorta. In the St. George's series of 32 cases, it was found in only 9.

In the St. Bartholomew's series of 24 cases, there were 8 cases of cardiac hypertrophy, and J. H. Bryant draws attention to the rarity of its occurrence among the cases at Guy's Hospital. It would therefore seem that a permanently raised blood-pressure, brought about by gradually increasing peripheral resistance, in the majority of cases cannot be an important factor in the production of aneurysm of the abdominal aorta.

If this is true, chronic intoxications due to gout, lead-poisoning, alcoholism, and similar conditions can only play a part in the production of aneurysm of the abdominal aorta by directly affecting the wall of the vessel. A high blood-pressure, due to peripheral arteriosclerosis and granular kidney, would probably cause an existing aneurysm to enlarge rapidly, but would have no power to initiate the formation of an aneurysm.

Nevertheless, it is not difficult to believe that a sudden rise of blood-pressure, due to violent exertion, might be the initial cause of aneurysm in a vessel already weakened by disease. Indeed, it seems probable that aneurysms attributed to ' strains ' are produced in this

[1] Cases IX. and XIX. [2] Case XXVI. [3] Case IV.

manner rather than by direct stretching or laceration of the arterial wall.

Situation.

Aneurysm of the abdominal aorta occurs more frequently in the neighbourhood of the origin of the cœliac axis than in any other part of the vessel. In the St. George's series of 32 cases, 17 aneurysms were found in the neighbourhood of the cœliac axis ; in the Guy's Hospital series of 54 cases, there were 36 ; and in 21 out of 24 cases at St. Bartholomew's Hospital the aneurysm was so situated. Crisp suggests that the prevalence of aneurysm in this part of the vessel may be due to some weakness of the wall caused by the origin of the cœliac axis.

The aneurysms found in the cases of the St. George's series were situated as follows :

Situation.	Saccular.	Fusiform.	Total.
Above cœliac axis	7	2	9
At level of cœliac axis	4	1	5
Below cœliac axis	2	—	2
Opposite first lumbar vertebra ..	1	—	1
Upper part of vessel	1	—	1
Just above renal arteries	1	—	1
At level of renal arteries	2	—	2
Just below renal arteries	1	—	1
Last 3 inches of aorta	7	3	10

The majority of the aneurysms near the origin of the cœliac axis arose from the front, while most of those situated lower down arose from the back of the aorta.

Varieties of Aneurysm.

Aneurysm of the abdominal aorta is commonly of the saccular type, and in many cases becomes diffuse.

Among the cases of the St. George's series, 34 aneurysms of the abdominal aorta were found; of these 6 were fusiform and 28 were saccular. One of the former[1] was a 'dissecting aneurysm.' Out of the 28 aneurysms of the saccular type, 14 became 'diffuse' or 'false.' J. H. Bryant draws attention to the prevalence of the saccular and diffuse varieties among the cases of the Guy's Hospital series. Cases of arterio-venous aneurysm have been met with, but they are extremely rare.

Extension.

Aneurysms of the abdominal aorta commonly extend laterally—more often to the left than to the right—and backwards. A few extend forwards, either directly or with a tendency to one or other side, and these are mostly situated in the neighbourhood of the cœliac axis. Extension directly backwards is rare, and only occurs in cases where the sac is small. In the St. George's series, the aneurysm extended into the left side of the chest in four cases.

TABLE TO SHOW DIRECTION OF EXTENSION IN THE CASES OF THE ST. GEORGE'S SERIES.

Situation of Aneurysm.	Left.	Right.	Backwards.	Forwards.
Above cœliac axis	5	—	—	3
Level of cœliac axis	2	2	—	1
Below cœliac axis	1	1	—	—
Level of first lumbar vertebra	1	—	—	—
Upper part of vessel . .	1	—	—	—
Just above renal arteries . .	1	—	—	—
Level of renal arteries . .	—	1	—	—
Just below renal arteries . .	—	—	1	—
Lowest 3 inches of aorta . .	4	2	1	1
Total	15	6	2	5

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[1] Case I.

Rupture.

The majority of cases of aneurysm of the abdominal aorta terminate by rupture. Death due to this cause occurred in 21 out of 32 cases at St. George's Hospital, in 43 out of 54 at Guy's Hospital, and in 20 out of 24 at St. Bartholomew's Hospital. Among the 54 cases collected by Crisp, death was due to rupture of the aneurysm in 34.

Aneurysms of the abdominal aorta commonly rupture into the retroperitoneal tissues or into the cavity of the peritoneum—more frequently into the former than into the latter.

Among the Guy's Hospital cases, hæmorrhage beneath the peritoneum occurred in 19, and into the peritoneal cavity in 12. Among the St. Bartholomew's Hospital cases, retroperitoneal hæmorrhage was found in 11, and hæmorrhage into the peritoneal cavity in 4.

Rupture into the thorax occurred in 11 cases at Guy's Hospital, and in 4 at St. Bartholomew's Hospital.

Among the 32 cases of the St. George's series,

Rupture	into the	retro-peritoneal tissues	took place in ..	11
,,	,,	peritoneal cavity	,, ,, ,, ..	5
,,	,,	left pleural sac	,, ,, ,, ..	3
,,	,,	left lung	,, ,, ,, ..	1
,,	,,	first part of the duodenum	,, ,, ..	1
		Total ..	.. ..	21

Cases of aneurysm of the abdominal aorta terminate by rupture much more frequently than cases of thoracic aneurysm.

Among the cases occurring at St. George's Hospital the figures were as follows :

	Number of Cases.	Number of Ruptures.	Percentage.
Thoracic aorta ..	134	40	22
Abdominal aorta ..	32	21	68

Symptoms.

In some cases, the disease is latent and causes no symptoms. In the St. George's series, there were two such cases,[1] in both of which the aneurysm was situated in the lower part of the vessel. In another case, cough with hæmoptysis was the only symptom.[2] Osler mentions that the condition was latent, and was only discovered post-mortem in two cases at the Johns Hopkins Hospital.

Pain is usually the earliest and most insistent symptom. It has been the most prominent feature of nearly all the cases recorded, and was present in twenty-seven of the St. George's cases. It is commonly persistent, and of a dull, aching nature, varied by paroxysms of terrible severity. Pressure on the abdomen sometimes affords slight relief, and rest in bed frequently produces marked improvement. Erosion of the vertebræ is usually associated with intense pain of a dull, boring character, but may cause very little discomfort, or even no pain at all.[3]

Pressure upon and stretching of the spinal nerve roots is associated with constant pain of a dull, aching character radiating to the parts supplied by the nerves affected. The paroxysms are probably due to the sudden stretching or breaking of nerve filaments caused by the yielding of some part of the sac. Extension of the sac in various directions may give rise to pain simulating that of pleurisy, renal colic, gall-stones, appendicitis and many other conditions.

Gastro-intestinal symptoms, such as constipation, vomiting and nausea, are common features of the disease, and are not especially associated with aneurysm of any particular part of the aorta.

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[1] Cases I. and IV.

[2] Case II.

[3] Case IV., and Morgagni's first case ; *vide* p. 3.

Hæmatemesis occurred in one case.[1]

Jaundice was present in several cases.

Hæmoptysis occurred in two cases.[2]

Cough and **dyspnœa** are present in most of those cases in which the thorax is affected.

Spasm and twitching of the muscles of the leg occurred in two cases,[3] in one of which, sensation was found to be permanently impaired.[4] This was due, no doubt, to pressure on the spinal nerve roots.

Weakness of the legs, with anæsthesia of the left gluteal and inguinal regions and of the left side of the scrotum, was found in one case.[5]

Turney and Ballance have published a case of aneurysm of the descending thoracic aorta in which there was intense pain, followed by paraplegia of the lower limbs (the paralysis being most marked on the left side), paralysis of the intercostal muscles from the sixth downwards, and retention of urine. The aneurysm had eroded the vertebræ, and had made its way into the spinal canal. The roots of the seventh nerves were swollen and pink in colour, but there was no degeneration either of the cord or of the nerves.[6]

Œdema of the right leg, which could only have been due to pressure caused by the aneurysm, occurred in one case.[7] Œdema was found in two other cases, but there was also organic disease of the kidneys.

Retention of Urine occurred in two cases, and was associated in both with displacement of the kidney by an enormous diffuse aneurysm.[8]

Insomnia is a constant symptom.

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[1] Case XXIV.

[2] Cases II. and XIV.

[3] Cases IX. and XXIII.

[4] Case XXIII.

[5] Case XXV.

[6] *Med. Chir. Trans.*, vol. lxxxii., p. 125.

[7] Case XXVIII.

[8] Cases IX. and XIV.; also case recorded by Ballonius; *vide* p. 2.

Wasting is a fairly common feature, and is due to the wearing nature of the disease.

Symptoms of Rupture.—(*a*) *Into the Peritoneum.*—Sudden attack of intense pain, followed by collapse, all the signs of profuse internal hæmorrhage and death.

(*b*) *Into the Retroperitoneal Tissues.*—Sudden attack of intense pain, followed by collapse and signs of internal hæmorrhage. If death does not occur immediately, gradual recovery takes place, and in some cases the patient is temporarily free from pain. If a tumour has previously existed it will generally be found to have undergone alteration ; it may have become larger or have disappeared altogether ; pulsation may have disappeared or become more marked. In some cases a tumour appears for the first time ; in others, the original tumour having disappeared, a fresh swelling may appear in a different part of the abdomen. Lastly, new symptoms may arise or old symptoms become more intense.

Diagnosis.

Reference has already been made to the difficulty of arriving at a right conclusion as to the nature of the disease in many cases of aneurysm of the abdominal aorta.

The condition was diagnosed in only 13 out of the 32 cases of the St. George's Hospital series. A great number of incorrect diagnoses were made, such as spinal caries, sciatica, empyema, nephritis, renal calculus, malingering, dyspepsia, typhoid fever, malignant disease, and pleurisy.

At Guy's Hospital, 'a correct conclusion, during life, as to the nature of the disease was arrived at in 18 only out of the 54 cases.'[1]

None of the symptoms already mentioned, whether occurring singly or together, are pathognomonic of the disease, and it is only in the presence of a palpable tumour pulsating in an expansile manner that a certain diagnosis of aneurysm of the abdominal aorta can be made. A pulsating tumour, over which a bruit is audible or a thrill felt, is not sufficient unless the pulsation is expansile.

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[1] J. H. Bryant, *Clinical Journal*, November 18 and 25, 1903.

Tumour.—A tumour was found in 14 of the St. George's cases and in 31 of the Guy's Hospital cases. It would seem that the frequent absence of a tumour is due to the fact, already pointed out,[1] that aneurysms of the abdominal aorta commonly extend laterally and backwards.

Pulsation was discovered in 15 cases at St. George's Hospital and in 35 at Guy's Hospital. Expansile pulsation was present in only 3 of the St. George's cases and in 8 of the Guy's Hospital cases. The presence or absence of palpable pulsation seems to depend chiefly upon the position of the sac, and upon the amount of fibrin deposited on its walls. The pulsation of a large diffuse sac lying behind the peritoneum is often not felt, but when the same sac, having increased in size, comes nearer to the surface, the pulsation may become palpable. A sac lined by a thick layer of laminated clot is well known to pulsate less strongly than one with thin walls.

Bruit.—A systolic murmur was heard in 10 of the St. George's cases and in 26 of the Guy's Hospital cases.

The factors governing the presence or absence of a bruit are not well understood. Corrigan has pointed out that, in many cases, it could be heard when the patient was lying down, though not when he was standing up. He attributed this to the decrease in hydrostatic pressure caused by the recumbent position.[2]

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[1] *Vide* p. 16.

[2] *Dublin Journal of Medical and Chemical Science*, 1832-33, vol. ii., p. 375.

Among the St. George's cases a bruit was more frequently heard when there was a true aneurysm than when the sac had become diffuse.

Examination by means of the Röntgen rays would seem to be valuable only as a means of confirming a positive diagnosis; since a large diffuse sac, lying in the retroperitoneal tissues, can throw no very definite shadow on the screen. This point is well illustrated in one of the St. George's cases.[1] The patient was twice examined by means of the Röntgen rays, and on both occasions a negative result was obtained.

The difficulty most frequently met with is that of deciding whether pulsation or a pulsating swelling in the abdomen is due to the presence of an aneurysm or not.

The following are some of the conditions in which abdominal pulsation occurs:

1. Normally, pulsation may be observed between the ensiform cartilage and the umbilicus. The pulsation is not synchronous with that of the heart, but is slightly delayed. It is due, as Allen Burns pointed out,[2] to movements of the liver caused by the cardiac impulse. This pulsation is much increased by exertion. In spare subjects a second pulsation is seen lower down, and slightly to the left of the umbilicus. This pulsation is slightly later than that already mentioned, and is caused by the abdominal aorta. In very thin persons this pulsation may be traced as far down as the bifurcation of the vessel. Morgagni drew attention to this point, quoting Berengarius and Prosper Martianus,[3] who had previously observed it.

2. In cases of great dilatation of the heart, as Mor-

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[1] Case XXXII.

[2] 'Diseases of the Heart,' 1809.

[3] 'Epist. Anat. Med.,' xxxix. 19.

gagni has pointed out,[1] the diaphragm may be pushed down, and an epigastric tumour be formed by the right ventricle. The pulsation in such cases is very forcible, and suggests an aneurysm of the abdominal aorta or of the cœliac axis. Osler quotes a case of this kind in a boy, aged five years, who was suffering from very advanced mitral disease.[2] 'Apex beat is in sixth and seventh interspaces, forcible, widespread, and extends laterally to the mid-axillary line. The precordial bulging is marked, and below the left costal margin, projecting for 4 centimetres and occupying the whole of the left quadrant of the epigastric region, is a prominent, heaving, pulsating, projection of remarkable dimensions. During coughing it becomes much larger. In this there is a very loud systolic murmur, and a rumbling murmur in diastole.' Osler remarks that it was evident that the tumour was only part of an enormously distended right ventricle; since 'the impulse was synchronous with the apex beat, and was directly continuous with the widespread throbbing of the heart.'

3. Neurotic or hysterical pulsation is met with most frequently in women, but is occasionally found in hypochondriacal men. A considerable number of the cases occur in women about the time of the menopause, in association with menstruation, and occasionally during pregnancy. The condition is often characterized by sudden onset, and is liable to recur. Morgagni describes the case of 'a chaste and pious virgin of forty-four years of age.' This lady had menstruated regularly up to two months before the attack. She became restless, and complained of itching of the eyes and eyebrows, and of epigastric palpitation. The

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[1] 'Epist. Anat. Med.,' xvii. 28.

[2] *Lancet,* October 14, 1905.

palpitation suddenly became very violent, and Morgagni was called in. He found violent pulsation in the epigastrium, suggesting the existence of an aneurysm, a diagnosis which had already been made. Morgagni, however, did not think that there was an aneurysm, for the following reasons :

(*a*) The patient was hysterical.

(*b*) The pulsations were extremely irregular in both force and frequency, while no such irregularity could be observed in the pulse at the wrist.

Venesection was performed, and the patient rapidly recovered.[1]

Three cases were published by Albers of Bremen :[2]

(1) The patient was a woman of twenty-four years of age, who had previously enjoyed good health. The attack occurred suddenly at the beginning of a menstrual period. The pulsation in the abdomen was extremely violent, and extended down to the bifurcation of the aorta. There were fainting fits, and blood was passed by the bowel. Under suitable treatment, the patient made a rapid recovery, and was restored to perfect health.

(2) The patient was a hypochondriacal man of forty years of age. The attack came on suddenly, and the symptoms were identical with those described above, excepting that there was also hæmatemesis, and the pulsation was not quite so violent. This patient also made a complete recovery.

(3) Albers describes the case as follows : ‘ With the wife of a tinsmith in this city, this pulsation is so certain a sign of pregnancy that she relies upon it more than all others. It is sometimes so violent that, as her

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[1] ‘ Epist. Anat. Med.,’ xxxix. 18.

[2] *Edinburgh Medical Journal*, vol. iii., p. 8, 1807.

husband assures me, it may be heard distinctly. After the third month it usually ceases entirely.'

The cases just described present the condition in its most acute form. In the majority of cases, the symptoms are less severe, but are extended over a longer period.

With regard to diagnosis, the following are the most important points :

(*a*) The condition is met with in neurotic and hysterical persons, whose whole attention is directed towards the abdominal pulsation, all other symptoms being regarded as incidental to it. In aneurysm, pulsation is scarcely ever the symptom from which the patient seeks to be relieved.

(*b*) The great majority of cases occur in women, among whom aneurysm is an extremely rare disease.

(*c*) Although the pulsation may be extremely violent, no definite tumour can be felt, and in most cases the aorta is easily palpable, though it is sometimes tender.

(*d*) In severe cases, the onset is sudden, and the most alarming symptoms—passage of blood by the bowel and hæmatemesis—are seldom met with in cases of aneurysm.

(*e*) If the patient is anæmic, a thrill may be felt, and a soft systolic bruit is sometimes heard with very light pressure of the stethoscope.

4. Tumours and cysts in the upper part of the abdomen may be seen to pulsate, the impulse of the aorta being communicated to them. Morgagni drew attention to this point,[1] and was of the opinion that the pulsation of an artery is actually increased by the pressure of a tumour lying upon it. Allan Burns remarked that 'a tumour placed over the course of an artery, and attached to it, always pulsates more strongly

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[1] 'Epist. Anat. Med.,' xxxix. 20.

than the vessel itself.'[1] In most cases, a diagnosis can be made by placing the patient in the 'knee-elbow position,' when, in the case of a tumour, the pulsation will cease, while an aneurysm will not be affected. Also, as was observed by Kennedy, a tumour moves with respiration, while an aneurysm does not.[2]

5. In cases of aortic regurgitation the aorta may throb so forcibly as to give rise to suspicions of aneurysm.[3]

6. Osler has pointed out that in cases of extreme anæmia 'there is throbbing of the arteries both visible and palpable, and the pulse may even have the Corrigan or "water-hammer" quality. The most extreme throbbing may be felt and seen in the abdominal aorta, and it is not infrequently a source of great distress to the patient. The impulse may be bounding, striking the hand with extraordinary force, and when associated with a thrill and a bruit it may suggest aneurysm very strongly.'[4]

7. Allan Burns refers to a case described by Senac in which regurgitation of blood along a greatly dilated inferior vena cava caused epigastric pulsation.

8. Osler remarks that in 'old men with thin abdominal walls a very sclerotic aorta may suggest aneurysm.'[5]

The greatest difficulties in diagnosis are encountered when the aneurysm has ruptured into the retroperitoneal tissues with the gradual formation of a large diffuse sac, in which there may be little or no pulsation. In these circumstances, as has been already pointed out, the symptoms of such conditions as appendicitis, gallstones, malignant disease or renal calculus may be produced, and several cases have been recorded in which operations have been performed for the relief of these and other diseases. The history is often indefinite, and, indeed, it is difficult to see how mistakes of this kind are to be avoided, especially in cases where the symptoms indicate a condition requiring immediate operation, such as appendicitis.

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[1] 'Observations on Diseases of the Heart,' 1809.

[2] Tufnell, 'Successful Treatment of Internal Aneurysm,' Dublin, 1864.

[3] Stokes, 'Diseases of the Heart and Aorta,' Dublin, 1854.

[4] *Lancet*, October 14, 1905.

[5] *Ibid.*

Prognosis.

The outlook is extremely grave and wellnigh hopeless, and as compared with that in thoracic aneurysm, the expectation of life is short.

Among the cases of the St. George's Hospital series, the average course of the disease, from the first appearance of symptoms, extended over fifteen months—the longest nine years, and the shortest nineteen days. Among the cases of the Guy's Hospital series, the duration of the average course was thirteen months—the longest twelve years, and the shortest fifty-four weeks.

Aneurysm of the abdominal aorta is seldom healed by Nature, and very few cures have been effected by treatment, whether medical or surgical.

In the St. George's Hospital series, only four healed aneurysms were found, all of which were of the saccular type. Three of these cases had received no special treatment,[1] while the fourth had been treated by Tufnell's method and iodide of potassium.[2]

Of the three cases in which spontaneous cure had taken place, one terminated fatally, owing to the rupture of a second aneurysm of the saccular type. The death of the patient treated by Tufnell's method was due to the rupture of an aneurysm of the saccular type, situated just above the one which had been treated successfully. In the Guy's Hospital series there were only two cases of healed aneurysm.

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[1] Cases IV., VII., and XXVII.

[2] Case XX.

Treatment.

The object of all the methods of treatment, except one, is to cure the aneurysm by inducing coagulation of blood in the sac. It is, therefore, obvious that success can only be hoped for, in cases where the aneurysm is of the saccular type.

But, though few cases have been cured, many have received considerable temporary benefit from some of the methods of treatment described hereafter.

Since the days of Valsalva, rest has formed the basis of every system of treatment prescribed by physicians for internal aneurysm. It is Nature's chief remedy for nearly every disease to which man is subject, and its beneficial effects are nowhere more strikingly exemplified than in cases of aortic aneurysm.

By rest, and especially by rest in the recumbent position, two important factors in favour of coagulation are secured—diminution in the number of the heart-beats and lowering of the blood-pressure.

1. **Valsalva's Treatment.**—Valsalva was the first to attempt the cure of internal aneurysm by systematic treatment, and the method has been described in detail by his pupil Morgagni.[1]

Valsalva based his treatment upon that recommended by Hippocrates for the cure of varices of internal veins —that the fluid in the body should be reduced to the lowest possible amount by blood-letting and restricted diet.

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[1] 'Epist. Anat. Med.,' xvii. 30.

With regard to the advantages of this treatment, Hippocrates added that, if it had been employed early, the veins would return to their normal position and size.

Albertini, a friend of Valsalva, had adopted this practice in cases of internal varix with considerable success, and it occurred to Valsalva that the treatment might be applicable to early cases of aneurysm. The method of treatment employed by Valsalva was as follows :

The patient was strictly confined to bed. As much blood as was thought desirable was drawn off, and the solid and liquid constituents of the diet were gradually reduced in quantity. When the patient had become so enfeebled that he could scarcely raise his hand from the bed, the diet was gradually increased in amount, until such degree of strength had been regained as warranted his being allowed to get up.

Valsalva's opinion as to the value of this treatment did not rest entirely upon its beneficial results, such as the cessation of pulsation, observed during life. He also had an opportunity of examining the body of a nobleman whom he had cured of aneurysm, but who had died of another disease. He found that the vessel which had been affected by aneurysm had returned to its normal diameter, though its wall at the part affected was somewhat hard.

Stancario succeeded in curing a young nun by means of this treatment. When she was first allowed to get up the pulsation returned, but it did not continue for long, and eventually ceased altogether.

Morgagni does not say whether these were cases of aneurysm of the thoracic or abdominal aorta, and Stancario's case, at all events, is open to suspicion in that it may have been merely one of 'throbbing abdominal aorta.'

Valsalva's treatment does not appear to have been very generally employed at any time, or to have given very satisfactory results. Morgagni's comment upon it is as follows: 'Non sum nescius, fore plures, quibus multo gravior Valsalvæ curatio, quam aneurysma suum videatur: eo præfertim tempore quo illa esse utilis posset.'[1]

2. **Tufnell's Treatment.**[2]—The method of treatment recommended by the late Mr. Tufnell, of Dublin, consists essentially of absolute mental and bodily rest, accompanied by a very greatly restricted diet. Rest produces a diminution in the number of the heart-beats and a somewhat lower blood pressure, while the restricted diet lowers the blood-pressure still further, and may perhaps increase the coagulability of the blood.

The blood-letting employed by Valsalva was strongly denounced by Tufnell as tending to weaken the patient unnecessarily, and to decrease the coagulability of the blood by removing fibrin from the circulation.

The following details of the treatment are given by Tufnell:

Absolute rest in the recumbent position for eight to ten weeks.

Diet—

Breakfast—White bread and butter	2 ounces.
Cocoa or milk	2 fluid ounces.
Dinner—Broiled or boiled meat ..	3 ounces.
Potatoes or bread	3 ounces.
Light claret or water	4 fluid ounces.
Supper—White bread and butter ..	2 ounces.
Milk or tea	2 fluid ounces.

The patient, therefore, received 10 ounces of solid food and 8 ounces of liquid in the course of a day.

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[1] 'Epist. Anat. Med.,' xvii. 31.

[2] 'Successful Treatment of Internal Aneurysm,' Dublin, 1864.

Although Tufnell was strongly of the opinion that he should, if possible, be kept within the limits stated above, he nevertheless advised that, if the patient suffered greatly from these restrictions and became restless, some small concession should be made ; in order that the condition of complete repose might not be sacrificed.

Tufnell published three cases of abdominal aneurysm cured by this treatment. One of these, the patient declining to follow Tufnell's advice as to the necessity of avoiding violent exertion, was terminated three and a half years later by rupture of the aneurysm.

Tufnell's treatment has been employed in a large number of cases, and has met with a fair measure of success ; for, although it seldom effects a cure, it not infrequently prolongs life by producing a certain amount of temporary improvement.

It is a method applicable only to aneurysm of the saccular type, and in such cases, when the aneurysmal sac communicates with the aorta by a small orifice, and when the treatment is employed early in the disease, there is some hope of a successful result. The great disadvantages of the treatment are that the result is uncertain, and that strength of mind of a more than ordinary character is demanded of the patient.

Five of the St. George's cases were treated by this method with the addition of potassium iodide. All were men.

The table on the following page gives the main points, showing four failures and one partial success.

Case XXVI. can scarcely be counted, since the man was only under treatment four days, and the aneurysm was of the fusiform type. Case XXIV. was an absolute failure. In Case XXI. life was probably prolonged.

Case.	*Age.*	*Period of Treatment.*	*Result and Remarks.*
XIX.	39	11 weeks and 4 days	Treatment well borne. Considerable improvement. Death 11 days after cessation of treatment from pulmonary trouble. Post-mortem : Large sacculated aneurysm of upper part, half full of laminated clot.
XX.	25	Under treatment 5 times ; first period, 11 weeks	(1) Left hospital cured, and did light work for 4 months. (2) Left hospital much improved ; did light work for 10 months. (3) Left hospital much improved ; did light work for 5 months. (4) Left hospital improved ; did no work, and returned in 3 months. (5) Remained in hospital about 1 month, and died from rupture of aneurysm. Post-mortem : Two saccular aneurysms of lower part, one above the other. Lower sac solid with old clot. Upper sac ruptured.
XXI.	39	Between 3 and 4 months	Considerable improvement. Sent to convalescent home, then discharged. Symptoms returned immediately, and patient died from rupture of sac about 2 months after cessation of treatment. Post-mortem : Large sacculated aneurysm at level of origin of cœliac axis. Sac lined by laminated clot to depth of 1½ inches.
XXIV.	28	2 months	Slight improvement for a time, but never left his bed. Death from rupture of sac into duodenum. Post-mortem : Large sacculated aneurysm just above cœliac axis. No ante-mortem clot.
XXVI.	29	4 days	Death from rupture of sac. Post-mortem : Large fusiform aneurysm of lower part of aorta and whole of right common iliac.

Case XX. may be regarded as a partial success. Life was undoubtedly prolonged, and it seems fair to surmise that the cure of the lower aneurysm was brought about by the first period of treatment. Still, it is possible that the formation of the upper sac may have materially assisted in the cure of the lower by decreasing to a slight extent the force of the bloodstream.

It is most unfortunate that the process of healing was cut short in Case XIX., since the presence of so much firm clot in the sac of the aneurysm indicated that considerable progress had been made.

3. **Treatment by Subcutaneous Injection of Gelatin.**—This method of treatment was devised by Lancereaux,[1] who considers it chiefly applicable to aneurysm of the saccular variety.

The details given by Lancereaux are as follows:

A sterilized solution consisting of 4 or 5 grammes of white gelatin in 200 c.c. of normal saline is injected under the skin, on the inside of the thigh, at intervals of from six to eight days, until twenty injections have been given. The patient should be confined to bed during the course of the treatment.

Lancereaux has published 8 cases treated by this method—7 of thoracic and 1 of abdominal aneurysm.

Of the thoracic cases, 1 was cured, 4 were greatly benefited, and 2 died. The abdominal case was much improved: the pain disappeared, the tumour became hard, and the pulsation was scarcely felt.[2]

Goloubinine collected 46 cases of aneurysm treated by this method, from all parts of Europe and America.[1] The results were as follows :

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[1] Lancereaux et Paulesco, *Bull. de l'Acad. de Méd. de Paris*, 1897.

[2] *Ibid.*, July 5, 1904.

Cured	3
Improved	17
General condition made worse	2
No effect	20
Death (one hour after first injection)	1
Result unknown	3

A case of abdominal aneurysm greatly improved, perhaps cured, by this method was published by Dusolier.[2]

G. Rankin has recorded 4 cases — 3 of thoracic and 1 of abdominal aneurysm—all of which were greatly improved. The patients were treated by Tufnell's method, received twelve injections of gelatin solution at the rate of two a week, and took 10 grains of potassium iodide thrice daily.[3]

The object of this method of treatment is similar to that of Tufnell's method—to promote the formation of clot in the sac of the aneurysm by increasing the coagulability of the blood. The results so far have been little, if any, more satisfactory than those obtained by Tufnell's method. Lancereaux's treatment, however, is superior to that of Tufnell in that it involves far less discomfort to the patient.

The gelatin treatment has, until recently, been very little used in this country, owing to the difficulty which has been experienced by some in obtaining efficient sterilization of the gelatin. It seems, however, to be the opinion of most authorities that no danger need be apprehended on this account, if the solution is prepared by a competent bacteriologist.

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[1] Cong. Internat. de Méd. Paris, 1900. Sect. de Thérapeut., *Comptes Rendus*, p. 45.

[2] *Arch. de Méd. et Pharm. Mil.*, Paris, 1902, p. 507.

[3] *Med. Chir. Trans.*, vol. lxxxvi., p. 33.

Huchard considered the 2 per cent. solution dangerous, as tending to cause too rapid coagulation. He therefore recommended the injection of 150 c.c. of a 1 per cent. solution.[1] The results obtained by means of this modification have not been satisfactory, and the danger apprehended by Huchard seems to be non-existent.

The principal objections which have been urged against Lancereaux's treatment are :

(1) That it is frequently unsuccessful.
(2) That the injections are painful.
(3) That the injections are followed by a rise of temperature.

Lancereaux has written a reply to these criticisms.[2]

He attributes the failure of the treatment to the following causes :

(1) To the application of the treatment to unsuitable cases, such as aneurysm of the fusiform type.
(2) To modifications of the treatment, such as the use of a weaker solution or a smaller number of injections than he recommends.

He maintains that no pain is caused if the solution is injected slowly, and he attributes the rise of temperature to imperfect sterilization of the gelatin.

4. **Drugs.**—A large number of drugs have been employed in the treatment of aneurysm without success.

The only drug which has stood the test of time and is, at present, in general use is potassium iodide.

The use of this substance in cases of aortic aneurysm was first recommended by Chuckerbutty of Calcutta.[3] In this country. Balfour was the first to draw attention

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[1] *Bull. de l'Acad. de Méd. de Paris*, October 26, 1899.

[2] 'Internat. Clinics,' vol. iv., p. 36.

[3] *Brit. Med. Jour.*, July 19, 1862.

TABLE OF CASES TREATED BY LIGATURE OF THE ABDOMINAL AORTA.

Surgeon.	*Reference.*	*Age.*	*Sex.*	*Condition.*	*Result and Remarks.*
Astley Cooper	'Surg. Essays,' Lond., 1828, part i., p. 201	38	M.	Aneurysm of left external iliac artery	Death 40 hours after operation. No peritonitis.
J. H. James	*Med. Chir. Trans.*, vol. xvi., part i., p. 1	44	M.	Aneurysm of internal iliac artery	Death 4 hours after operation from intraperitoneal hæmorrhage.
J. Murray	*Lond. Med. Gaz.*, vol. xiv., p. 68	33	M.	Aneurysm of common and external iliacs of right side	Death 23 hours after operation.
Monteiro	*Lancet*, 1842, vol. i., p. 334	31	M.	Aneurysm of right femoral, diagnosed as an aneurysm of external iliac	Death on eleventh day.
South	*Lancet*, 1856, vol. ii., pp. 47, 222	21	M.	Diffuse aneurysm of left common and left external iliac arteries	Death 43 hours after operation.
Hunter McGuire	*Amer. Jour. of Med. Science*, 1868, p. 415	30	M.	Aneurysm involving lower part of aorta, both common iliacs and left external iliac	Death 11½ hours after operation.

W. Stokes	*Dublin Quarterly Jour.*, vol. xlviii., p. 1	50	M.	Aneurysm of right common iliac, external iliac, and upper part of femoral	Death 13 hours after operation.
P. H. Watson	*Brit. Med. Jour.*, 1869, vol. ii., p. 216	—	—	Ligature of external iliac, followed by secondary hæmorrhage	Death 65 hours after operation.
Czerny	*Wien. Med. Woch.*, 1870, pp. 1, 402	27	M.	Wound involving internal iliac	Death 27 hours after operation.
Do.	*Centralb. für Chir.*, 1879, vol. vi., p. 737	50	M.	Impossible to ligature renal artery in operation for nephrectomy	Death 10 hours after operation.
Milton	*Lancet*, 1891, vol. i., p. 85	45	M.	Ruptured aortic aneurysm 1½ inches below renal arteries	Death 24 hours after operation.
Tilleaux	*Lancet*, 1891, vol. i., p. 85	56	M.	Diffuse aneurysm of left iliac artery	Death on twenty-ninth day.
Keen	*Phil. Med. Jour.*, 1900, p. 470	52	M.	Ruptured aneurysm of abdominal aorta	Death on forty-eighth day.
R. J. Morris	*Annals of Surgery*, vol. xxxv., p. 207	24	F.	Aneurysm of abdominal aorta	Death from septicæmia 53 hours after operation.

to its value in these cases.[1] It is given in doses of from 15 to 20 grains three times a day, and is of the greatest value in reducing the pain. Whether the treatment has any curative effect is extremely doubtful, nor has it been proved that the syphilitic cases derive greater benefit from it than the non-syphilitic. The mode of action is not understood : Chuckerbutty thought that it increased the coagulability of the blood, whilst Balfour regarded it rather as a nerve sedative. In practice, potassium iodide is frequently employed in combination with Tufnell's treatment.

In cases of thoracic aneurysm the writer has found aspirin, in doses of from 15 to 20 grains four times a day, of the greatest value in reducing pain. It has frequently been successful when potassium iodide and all other drugs have, for various reasons, been little better than useless. There seems to be no reason why it should not be equally valuable in cases of abdominal aneurysm.

5. **Compression of the Aorta.**—This method of treatment was introduced in 1864 by Murray of Newcastle, who published a case in which it had been entirely successful.[2] The aorta is compressed by means of a tourniquet applied to the abdomen, and the tourniquet is gradually tightened until all pulsation in the vessel ceases.

The following are some of the details given by Murray.

The patient was kept under the influence of chloroform during the whole time of application of the tourniquet on both occasions.

April 16, 1864.—The application lasted two hours. The pulsation of the arteries in the lower limbs was completely arrested, except during momentary displacements of the instrument. There was no visible improvement when the tourniquet was removed.

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[1] *Edinburgh Medical Journal*, 1868, xiv., pp. 33-47.

[2] *Med. Chir. Trans.*, vol. xlvii., p. 187.

April 19.—The application lasted five hours, and resulted in complete cure. The patient enjoyed good health for six years, and then died from the rupture of a second aneurysm. The body was examined, and the original aneurysm was discovered as a fibrous mass.

The aorta may be compressed either above or below the aneurysm, according to the position of the sac. In Murray's case the aneurysm arose from the lower part of the vessel, and the pressure was therefore applied above it.

About 10 cases treated by this method have been published.[1] The results were as follows :

Successful	5
Fatal	4
No effect	1

The fatal results were due to bruises of the intestines, caused by compression between the tourniquet and the aorta. In order to overcome this defect in the method, Keen suggested that a preliminary laparotomy should be performed, and that the aorta should be directly compressed by means of a clamp.[2]

6. **Ligature of the Aorta.**[3]—This operation was first performed by Sir Astley Cooper. It is the only method of treatment which offers any hope of cure in cases of fusiform aneurysm. Fourteen cases have been recorded, and in all of them the result has been fatal.

7. **McEwen's Method** of needling the inner lining of the sac, in order to induce thrombosis is only applicable to cases in which the aneurysm lies against the abdo-

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[1] Ashurst's 'Internat. Encyclop. of Surgery.'

[2] *Philadelphia Medical Journal*, 1900, p. 470.

[3] Table, p. 36.

TABLE OF CASES TREATED BY MOORE'S METHOD.

Surgeon.	*Reference.*	*Age.*	*Sex.*	*Operation.*	*Result and Remarks.*
Loreta	'Memoirs Royal Acad. Bologna,' 1885, vol. vi., series iv.	32	M.	Laparotomy : 6 feet fine silvered copper wire, introduced through fine cannula	Left hospital in 10 weeks. Hard mass size of walnut in place of pulsating sac. Died 3 weeks later from rupture of aorta at junction with lower end of aneurysm.
Morse	*Pacific Med. and Surg. Jour.*, Feb., 1887	32	M.	Laparotomy : $5\frac{1}{2}$ feet of $\frac{1}{2}$-millimetre silver-plated copper wire introduced through needle 1 millimetre in diameter	Left hospital in 8 weeks. Small hard nodule in place of pulsating tumour. Had good health, doing very heavy work for 4 years. Died from hæmatemesis following kick in stomach.
Pringle and Morris	*Med.Chir.Trans.*, vol. xx., p. 261	46	M.	Laparotomy : 1 foot of steel wire passed through cannula	Died on fifth day from asthenia. Large quantity of ante-mortem clot found in sac.

Lange	*Phil. Med. News*, 1886, vol. xlix., p. 582	—	—	Aneurysm already ruptured; 24 feet of wire passed without laparotomy	Death 12 days later from pneumonia.
Stevenson	*Lancet*, Jan. 5, 1895	25	M.	Laparotomy: 2 yards very fine steel wire passed through cannula	Death in 27 hours after operation from syncope.
Langton	*Brit. Med. Jour.*, April 1, 1899	—	F.	Laparotomy: 5 feet of silver wire passed through cannula	Hard mass in place of pulsating tumour. In good health a year after operation.
Parnham	*Amer. Medicine*, June 22, 1901 (article by R. Matas)	—	M.	Laparotomy: 26 feet of steel wire passed through cannula	Died on forty-fifth day. Wire had entered left ventricle and had also perforated aorta.
D'Arcy Power	*Med. Chir. Trans.*, 1903, vol. lxxxvi., p. 365	29	M.	Laparotomy: 80 inches No. 7 silver wire passed by means of G. H. Colt's apparatus	Death 50 hours after operation. Loop of wire 7 inches long had passed up to arch of aorta.
Holt	*R.A.M.C. Jour.*, 1904, vol. iii., p. 175	—	M.	Laparotomy: sac wired by means of Colt's apparatus	Death on third day from broncho-pneumonia

minal wall. One case is recorded in which this method was employed unsuccessfully after a preliminary laparotomy.

7. **Galvano-puncture,** introduced by Cinicelli, is still employed in Italy in cases of thoracic aneurysm.

The same restrictions apply to this method as to McEwen's, with regard to its application to cases of abdominal aneurysm.

8. **Moore's Method.**[1]—The treatment of aneurysm by the introduction of foreign bodies into the sac, in order to induce clotting, was invented by Moore in 1864.[2] The case upon which Moore operated was one of aneurysm of the ascending aorta. Seventy-eight feet of fine wire were passed into the sac, and death occurred on the fifth day after operation. Moore was of the opinion that too large a quantity of wire had been used. Operations by this method upon 9 cases of aneurysm of the abdominal aorta have been recorded. In 2 cases the operation resulted in cure ; in 2 the patient was killed by pulmonary trouble, and the remaining 5 cases ended fatally. The length of wire used varied from 1 to 6 feet. Apart from the risks inseparable from an operation of such severity, the chief dangers seem to be that the wall of the sac or of the vessel may not be strong enough to resist the pressure of the wire, and that the surgeon has no control over the direction taken by the wire within the vessel. Parnham's case illustrates both of these points : the wire was found to have entered the left ventricle, and also to have perforated the wall of the aorta. In D'Arcy Power's case a loop of wire 7 inches long had passed up to the arch of the aorta.

9. **Moore-Corriadi Method.**—With a view to increasing the rapidity of coagulation, Corriadi suggested that a

[1] Table, p. 40.

[2] *Med. Chir. Trans.*, 1864.

constant current should be passed through the wire introduced into the aneurysm by Moore's method. This method was first employed in 1879 by Burresi.[1] The patient lived for three and a half months after the operation. Thirteen cases of aneurysm of the abdominal aorta treated by this method have been recorded. The results were as follows: In 2 cases the operation was successful, one of the patients dying eight months later from acute dysentery, the other three and a half years later from rupture of the sac. In one case no effect was produced. The remaining 10 cases terminated fatally. The length of wire used varied from 1½ to 18 feet. In 12 cases the wire was silver or silver-plated; in one case gold wire was used. The positive pole of the battery should be attached to the wire. In most cases the current was gradually raised to about 70 milliampères, and maintained at this point for about an hour. Currents of this strength are not without danger, since in Finney's first case the wall of the sac had been slightly burned by a loop of wire resting against it.

The necessity for so large a current is open to doubt; since in Finney's second case, the most successful of the series, the amount of the current used did not exceed 10 milliampères. The dangers of this operation are similar to those associated with Moore's unmodified method. In 2 of the cases the wire was found to have passed upwards into the thoracic aorta; in Reeve's case it had reached the aortic valves, and in Griffiths' it extended into the thoracic aorta for 2½ inches.

In addition to the disadvantages already mentioned, this operation lasts much longer than Moore's, and, owing to the character of the apparatus required, the risk of septic infection is greatly increased. It has also been pointed out that, in cases of aneurysm involving the origin of a visceral artery, a rapid thrombosis might cause infarction of the intestine. If the results be compared, it is difficult to see that the operation, as modified by Corriadi, is in any way superior to the original method; while there can be no doubt that the former exposes the patient to greater danger than the latter.

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[1] *Lo Sperimentale*, April, 1879.

TABLE OF CASES TREATED BY THE MOORE-CORRIADI METHOD.

Surgeon.	*Reference.*	*Age.*	*Sex.*	*Operation.*	*Result and Remarks.*
Stewart	*Amer. Jour. of Med. Science*, 1892, vol. civ., p. 422	30	M.	2½ feet heavy silver wire. Current gradually increased to 70 milliampères, and kept at that strength for 1 hour	Death on ninth day from rupture of sac. Aneurysm involved lower part of thoracic and upper part of abdominal aorta. Sac contained much ante-mortem clot.
Stewart	*Phil. Med. Jour.*, Nov. 12, 1898	40	M.	10 feet fine silver wire. Current 50 milliampères for half an hour	Death on fifth day from hæmorrhage into stomach ; cause not discovered. No clot in sac.
Noble	*Phil. Med. Jour.*, 1898, vol. i., p. 1203	37	M.	8½ feet hard-drawn No. 30 gold wire. Current for 35 minutes, slowly increasing to 70 milliampères	Left hospital 6 weeks after operation. Tumour hard and much reduced in size. Died 8 months later from acute dysentery

Surgeon.	*Reference.*	*Age.*	*Sex.*	*Operation.*	*Result and Remarks.*
Halsted	*Johns Hopkins Hospital Bull.*, Nov., 1900 (article by G. L. Hunner)	27	M.	17 inches No. 27 silver wire. Current passed in 12 minutes. 38 inches, No. 25 silver wire: current 30 to 100 milliampères for 1 hour and 35 minutes	Death 40 hours after operation from rupture of sac. Small amount of loose coagulum in sac.
Finney	Do.	25	M.	5 feet silver wire (alloyed with copper 75 to 1,000). Current 30 milliampères (increased 10 milliampères every 5 minutes) to 70 milliampères, at which strength it was kept for 1 hour	Death on twentieth day from gradual hæmorrhage through thin wall of sac into adherent duodenum. Much antemortem clot in sac. In one place the wall of sac had been slightly burned by current passed through wire.
Reeve	*Annals of Surgery*, 1899, vol. xxx., p. 704	49	M.	7 feet silver-plated soft copper wire. Current of 80 milliampères for 50 minutes	Death 24 hours after operation. Wire had passed up aorta and reached aortic valves.
Finney	*Johns Hopkins Hospital Bull.*, Nov., 1900 (article by G. L. Hunner)	30	M.	8 or 9 feet of highly-drawn sterling silver wire. Current of 10 milliampères for 1 hour	Patient left hospital 6 weeks after operation, much improved, though there was still slight pulsation in tumour. Died 3½ years after operation from rupture of sac.[1]

Matas	*Amer. Medicine*, June 22, 1901	23	M.	10 feet No. 28 silver wire. Current of 75 milliampères for 4 hours and 20 minutes	Death 9 days after operation, from rupture of sac.
Maunsell	*Trans. Royal Acad. Med. Ireland*, vol. xxii., p. 109, 1904	28	M.	18 feet No. 28 silver wire. Current, 65 milliampères for 35 minutes	Death on forty-seventh day from rupture of sac. Large quantity of firm clot in sac.
Not given	*Lancet*, Oct. 14, 1905 (article by W. Osler)	36	M.	No details	Death on ninth day from rupture of sac into peritoneum.
Do.	Do.	53	M.	Do.	Discharged 4 weeks after operation. No change.
Do.	Do.	49	M.	Do.	Rupture into peritoneal tissue; diffuse aneurysm 2 months after operation. Death 4½ months later.
Griffiths	*Lancet*, Aug. 12, 1905	37	M.	6 feet fine silver wire. Current, 15 to 25 milliampères for 15 minutes	Death 5½ hours after operation. Wire extended 2½ inches into thoracic aorta.

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[1] Osler, *Lancet*, October 14, 1905.

CONCLUSIONS

1. THAT the incidence of aneurysm of the abdominal aorta among the 'working classes' of London is 2 in 1,000.

2. That the incidence varies considerably in different parts of the world.

3. That aneurysm of the abdominal aorta occurs much less frequently than aneurysm of the thoracic aorta.

4. That aneurysm of the abdominal aorta occurs most frequently in the *early* prime of life.

5. That the disease is very uncommon in women.

6. That it is improbable that hard work, apart from sudden effort, is capable of producing aneurysm of the abdominal aorta.

7. That it is unlikely that indirect injuries or 'strains' are capable of producing aneurysm in a healthy vessel.

8. That aneurysms of the abdominal aorta, attributed to 'strains,' are probably due to a rise of blood-pressure caused by a sudden violent effort.

9. That chronic intoxications are only capable of producing aneurysm of the abdominal aorta by directly causing disease of the aortic wall.

10. That in some cases aneurysm is due to congenital defects in the vessel wall.

11. That aneurysm of the abdominal aorta occurs most frequently in the neighbourhood of the cœliac axis.

12. That aneurysm of the abdominal aorta is commonly of the saccular type, and frequently becomes diffuse.

13. That aneurysm of the abdominal aorta commonly extends laterally, more often to the left than to the right, and backwards.

14. That the majority of cases terminate by rupture.

15. That aneurysms of the abdominal aorta rupture into the retroperitoneal tissues more frequently than into any other part.

16. That cases of aneurysm of the abdominal aorta terminate by rupture much more frequently than do cases of aneurysm of the thoracic aorta.

17. That gastro-intestinal symptoms are not especially associated with aneurysm of any particular part of the abdominal aorta.

18. That examination with the Röntgen rays would seem to be valuable only as a means of confirming a positive diagnosis.

19. That the average course of the disease extends over, from thirteen to fifteen months.

20. That the results of the gelatin method of treatment are no more satisfactory than those obtained by Tufnell's method.

21. That the operation for ligature of the abdominal aorta has not been justified by results.

22. That there is no evidence to show that the Moore-Corriadi operation is in any way superior to the unmodified method.

23. That the use of large currents in the Moore-Corriadi operation is not without danger, and does not appear to be of any advantage.

						artery				caused by injury received 3 years before.
III.	48	M.	Do.	Much atheroma	Pain; cough; dyspnœa; sickness	Crepitations and dulness on percussion at bases of both lungs	From level of fourth dorsal vertebra to origin of cœliac axis	Fusiform	Rupture of thoracic portion into mediastinum	7 months	General anasarca, due to renal disease.
IV.	32	M.	Do.	Not noted	None	None	Below origins of renal arteries	Saccular; diffuse, filled with laminated clot	Septic intoxication	—	Compound fracture of tibia.
V.	40	M.	Billiard-marker	Do.	Pain; sensation of throbbing; jaundice	Pulsating tumour; bruit	Upper part of vessel	Saccular; diffuse	Rupture into peritoneal cavity	20 months	No physical signs till 1 month before death.
VI.	69	M.	Not noted	Extensive atheroma	Cough; dyspnœa; pain in chest	None	Root of cœliac axis	Saccular; nearly filled with laminated clot	Œdema of lung	—	Renal disease.
VII.	31	M.	Printer's reader	Not noted	Pain	Do.	Opposite to first lumbar vertebra	Saccular; diffuse	Rupture into retroperitoneal tissues	2 years	—
VIII.	46	F	Charwoman	Atheroma	Pain; vomiting	Do.	3 inches above bifurcation	Do.	Do.	9 months	—
IX.	30	M.	Carpenter	Do.	Pain; twitching and spasms of muscles of leg; dysuria	Swelling in left inguinal region; irregularity of lower part of spine and sacrum	Sac in left lumbar region	Do.	Rupture into peritoneal cavity	14 months	Fall from height of 15 feet, injuring shoulder, 4 years before death.
X.	40	M.	Labourer	Extensive atheroma	Pain	Epigastric pulsation; bruit	Below origin of inferior mesenteric artery	Do.	Rupture into retroperitoneal tissues	10 months	Two aneurysms of thoracic aorta.
XI.	29	M.	Organist	Do.	Do.	None	Below origin of cœliac axis	Do.	Rupture into peritoneal cavity	—	—
XII.	35	M.	Gardener	Do.	Pain; epigastric palpitation; vomiting	Epigastric pulsation	Below diaphragm	Saccular	Rupture of thoracic aneurysm into left pleural cavity	9 months	Large fusiform aneurysm of thoracic aorta.
XIII.	25	M.	Sailor	Do.	Pain	None	Do.	Do.	Rupture into retroperitoneal tissues	17 months	—
XIV.	30	M.	Butler	Not noted	Pain; cough, with 'rusty sputum'	Tumour, with expansile pulsation; systolic murmur	Near origin of cœliac axis	Saccular; diffuse	Œdema of lungs	16 months	—
XV.	31	M.	Carpenter	Atheroma	Pain	Impaired percussion resonance on left side of chest	Below diaphragm	Do.	Rupture into left lung	15 months	—
XVI.	33	M.	Coal-heaver	Not noted	Do.	Slight pulsation and ecchymosis above iliac crest	Below origin of cœliac axis	Saccular	Rupture into retroperitoneal tissues	8 weeks	—
XVII.	39	M.	(1) Sailor; (2) clerk	Atheroma	Do.	Percussion dulness and 'boggy feeling' in epigastrium	Below diaphragm	Do.	Rupture into left pleural cavity	1 year	—
XVIII.	45	M.	(1) Marine; (2) stableman	Do.	Pain; 'sensation of weight'; hiccough; vomiting	Tumour, with expansile pulsation; systolic murmur	Above origin of cœliac axis	Do.	Rupture into peritoneal cavity	6 months	—
XIX.	39	M.	Gardener	Do.	Pain	Pulsating tumour; systolic murmur	Upper part of abdominal aorta	Saccular; partly filled by laminated clot	Pleural effusion; collapse and œdema of lungs	3 years	Symptoms dated from 'twist,' due to lifting heavy spadeful of earth. Treated by Tufnell's method and potassium iodide.
XX.	28	M.	(1) Greengrocer; (2) carman	Healthy	Pain; vomiting	Pulsating tumour; bruit	(1) Above bifurcation; (2) above '(1)'	(1) Saccular, filled with laminated clot; (2) saccular	Rupture of '(2)' into retroperitoneal tissues	3 years	Treated by Tufnell's method and potassium iodide.
XXI.	39	M.	Policeman	Atheroma	Pain; abdominal palpitation	Tumour, with expansile pulsation; systolic bruit	Below diaphragm	Saccular	Rupture into retroperitoneal tissues	9 years	Symptoms dated from accident to back. Treated by Tufnell's method.
XXII.	35	M.	Labourer	Do.	Pain	Pulsating tumour; systolic bruit	Involving origin of cœliac axis and superior mesenteric artery	Do.	Do.	1 month	—
XXIII.	47	M.	Bootmaker	Healthy	Do.	Pulsating tumour; systolic bruit	—	Do.	Do.	8 months	—
XXIV.	28	M.	Porter	Do.	Pain; jaundice; hæmatemesis	Tumour, with expansile pulsation; systolic bruit	Above cœliac axis	Do.	Rupture into first part of duodenum	6 months	Treated by Tufnell's method and iodide of potassium. Small aneurysm of thoracic aorta.
XXV.	27	M.	Cab-driver	Do.	Pain; anæsthesia of left gluteal and inguinal regions	Tumour (simulating empyema)	Below diaphragm	Do.	Rupture into left pleural cavity	1 year	—
XXVI.	29	M.	Engineer	Hypoplasia	Pain	Tumour, with expausile pulsation	Involving lowest 2½ inches of aorta and whole of right common iliac artery	Fusiform	Rupture into peritoneal cavity	1 month	History of severe strain. Tufnell's treatment and potassium iodide.
XXVII.	30	F.	Married	Do.	Vomiting; pain; symptoms of enteric fever	Slight distension of abdomeu	Involving lowest 2½ inches of aorta and greater part of left common iliac artery	Fusiform	Rupture into retroperitoneal tissues	19 days	Aneurysm of renal and superior mesenteric arteries.
XXVIII.	49	M.	Printer	Much atheroma	Pain; swelling of leg	Pulsating tumour	1 inch above bifurcatiou	Saccular; diffuse	—	9 months	Enormous sac filling half abdomen.
XXIX.	28	M.	Labourer	Atheroma	Pain; vomiting	Tumour	Origin of right renal	Do.	Rupture into peritoneal cavity	5 months	—

PART II.—CASES

CASE I.

THE patient, a woman aged seventy-three years, was admitted to the hospital on June 14, 1843, under the care of Mr. Hawkins. She was suffering from gangrene of the right foot, of which she eventually died on August 25.

Post-mortem Examination.

Thorax.

Heart.—Flabby. Hypertrophy of left ventricle. Aortic valves presented several small but firm deposits of bone.

The Aorta at its commencement was dilated, and presented numerous patches of atheromatous deposit. There were several fine deposits of bone near the origin of the large vessels from the arch of the aorta.

Abdomen.

About midway between the origin of the inferior mesenteric artery and the bifurcation of the aorta, the vessel was enlarged to a diameter of about 3 inches. The dilatation affected all the coats and extended for about 2 inches along the vessel. The internal coat was white, much thickened, inelastic and much ulcerated.

Between this and the outer coat, was a considerable interval, filled with a pulpy, brown, semi-fluid substance. mixed here and there with gritty deposit. The internal surface of the dilated portion was lined with coagula of blood, some of which were firmly adherent in those situations where the internal coat was ulcerated. The femoral arteries were firm and hard throughout their extent. The anterior tibial artery of the left side was thickened but not ossified.

CASE II.

The patient, a man aged twenty-nine years, was admitted to the hospital on March 21, 1844, under the care of Mr. Hawkins. He had had fairly good health up to about three years before admission, when he had sustained an injury to his ankle-joint. This injury resulted in some chronic disease, on account of which patient came to hospital. The leg was amputated below the knee on April 11. Erysipelas developed in the stump, but, by about the first week in May, patient had so far improved that hopes were entertained of his ultimate recovery. He had all along been troubled by cough. On May 25 there was hæmoptysis. This continued, and the patient gradually sank, and died on June 4.

Post-mortem Examination.

Body much emaciated.

Thorax.

Right Lung.—Anterior part very emphysematous; posterior part gorged with frothy serum of a red colour. Spots of ecchymosis on back part of lower lobe underneath the pleura.

Left Lung. — Anterior part emphysematous. Posterior part adherent to chest wall by soft adhesions. Under surface of lower lobe adherent to diaphragm, and completely solidified by effusion of blood into its structure.

Pericardium and Heart.—Nothing remarkable.

Abdomen.

Liver.—Normal.

Spleen.—Very large, and reduced to a bag containing soft pulpy matter.

Kidneys.—Much larger than normal, soft, affected by 'mottling degeneration'; surfaces smooth. The cellular membrane surrounding the left kidney was infiltrated with a quantity of thick pus, which was in contact with a large aneurysmal pouch.

This aneurysm communicated with the abdominal aorta by an opening about the size of a pea, which was situated in the postero-lateral wall of the vessel, just above the origin of the left renal artery. The sac of the aneurysm lay in contact with the bodies of the tenth, eleventh and twelfth dorsal and two first lumbar vertebræ, which were eroded. It had passed upwards, and, having partially destroyed the diaphragm, had come in contact with the lower surface of the left lung which had served to strengthen the wall of the sac. The hæmorrhage had taken place through two or three small ulcerated openings leading into the substance of the lung. The sac of the aneurysm contained much laminated clot. The various coats of the artery entered but little into the formation of the sac, the walls of which were largely formed by neighbouring structures and condensed cellular tissue. The artery presented no disease whatsoever in any part of its course.

Intestines.—Normal.

Stump.—Healthy. Two or three small collections of pus in groin; the pus here presented 'a healthy appearance.'

CASE III.

The patient, a man aged forty-eight years, was admitted to the hospital on September 24, 1845, under the care of Dr. Wilson. He had spent a considerable portion of his life in India. Patient had been in the hospital for slight anasarca of the lower extremities, about six months previous to his admission. The anasarca had entirely disappeared under treatment with diuretics. At that time, patient was complaining of pain in the loins. His urine was albuminous, with a specific gravity of 1·014. He stated that, after leaving the hospital, he had been tolerably comfortable up to six weeks before his readmission, although he had constantly had a certain amount of pain in the loins, and his legs had swelled occasionally, after long standing. About six weeks before his readmission, however, patient's legs had again swollen up, and the swelling had been gradually increasing. During the last fortnight the pain in the loins had become greatly aggravated, and he had suffered from cough and dyspnœa.

On Admission.—Patient was very pale. He was suffering much from dyspnœa and cough, with copious frothy mucous expectoration. There was general anasarca of the whole body, which pitted easily on pressure.

Heart: action regular; slightly increased impulse;

sounds louder than normal ; no murmur ; somewhat extended dulness in region of heart. Lungs : crepitant râles audible at both bases ; respiration otherwise normal. Over the loin were the marks of over one hundred leeches which had been applied in India. Constant and excessive pain in the loin. Nothing else abnormal found. Urine albuminous ; specific gravity, 1·009 to 1·016 ; abundant in quantity. Diuretics and purgatives were employed, but with little effect. Patient was much troubled by flatus and by excessive pain in various parts of the abdomen, causing sensations of faintness which were greatly relieved by ether.

Patient improved slightly and said that he was more comfortable ; his appetite was better, and the orthopnœa and dyspnœa had been considerably relieved.

On October 17, however, after he had previously for some days complained of increased pain in the loins and of vomiting which had now supervened, patient's breathing became much more oppressed. On the 19th, the lower part of the chest on both sides was found to be dull on percussion. The dyspnœa and orthopnœa rapidly increased, and he died on October 20, without having manifested any further symptom.

Post-mortem Examination.

Body well formed ; general anasarca and ascites.

Thorax.

Both pleural cavities contained a great quantity of dark-coloured fluid tinged with blood. Both lungs were normal anteriorly, but posteriorly they were intensely œdematous.

Pericardium.—Healthy.

Heart.—Dilatation and slight hypertrophy; valves normal.

Thoracic Aorta. From origin to termination, greatly thickened by large irregular patches of soft atheroma. At the level of the eighth dorsal vertebra, the aorta presented a large aneurysmal pouch, which occupied the length of the four last dorsal and first lumbar vertebræ. The coats of the aneurysm were, for the greater part, formed by a dilatation of the thickened and atheromatous coats of the vessel, which had given way at one place and allowed of a recent extravasation of blood into the cellular tissues of both mediastina. The ulcerated opening was situated at the upper and front part of the pouch.

Abdomen.

The cavity of the peritoneum was filled with large quantities of fluid of a milky appearance.

A large quantity of blood had made its way along the course of the œsophagus into the subperitoneal tissues at the back of the abdomen.

The aneurysmal dilatation of the aorta occupied also the upper part of the abdominal aorta, but did not extend further downwards than the origin of the cœliac axis. The whole of this portion of the aorta was closely studded with large thick patches of atheroma.

Liver.—Partially adherent to diaphragm, stomach and transverse colon. By these adhesions the foramen of Winslow was blocked up. The liver itself was much congested (venous hepatic congestion of second degree) and somewhat contracted.

Spleen.—Firm and much congested; capsule thickened in patches; adherent by old adhesions to neighbouring structures.

Kidneys.—Smaller than normal, presenting remarkably good specimens of 'mottling degeneration.'

Other structures normal.

Case IV.

The patient, a man aged thirty-two years, was admitted to the hospital on April 30, 1847, under the care of Mr. Keate.

The patient had been healthy and temperate. He was brought into hospital in a sensible condition, after having fallen from a window 22 feet above the ground.

He had sustained very severe injuries to his right leg, which was fractured in several places ; among the injuries was a compound fracture of the tibia. 'The patient obstinately refused to submit to amputation,' and the wound in the right leg became septic. The infection spread to the knee-joint and to other structures, and eventually the patient died of septic intoxication on November 25. There were no symptoms suggesting the presence of an aneurysm.

Post-mortem Examination.

Thorax.

Nothing of interest.

Abdomen.

A little below the origin of the renal arteries was a small aneurysmal cavity, situated behind the aorta, with which it communicated by a circular opening in the posterior wall of the vessel. The sac was almost filled by layers of coagulum. Its walls were formed by the surrounding cellular tissue, which had been condensed, and by the anterior surface of the bodies of the vertebræ, two of which were ulcerated to a slight extent.

The Kidneys were slightly granular.

Other organs normal.

CASE V.

The patient, a man aged forty years, a billiard-marker by occupation, was admitted to the hospital on December 12, 1855, under the care of Dr. Page. He had always had good health until eighteen months before his admission to hospital, when he began to feel pain in the loins on rising in the mornings. In the previous March, he had had an attack of 'inflammation of the bowels,' after which he suffered some pain in the back, left hip and groin. He described the pain as a sensation of 'gnawing.' Patient slept well and had a good appetite. The case was regarded as one of lumbago and up to January 16, 1856, it was treated as such.

January 16.—Slight and regular pulsation in the left loin was discovered. There was no bruit and no tumour could be detected, nor was pulsation distinguishable in front. At that time, patient was passing large quantities of urine which had a specific gravity of 1·009 and contained traces of albumin. Some morbid condition of the kidney was, therefore, suspected.

In the course of a few days, the pulsation had increased and was found to be most strongly marked just above the crest of the ileum, especially when the patient turned on his right side. Patient's nights were restless, and the pain in the loin was greatly increased.

January 21.—Patient was unable to turn over in bed without making a great effort. His appetite was failing very much.

January 23.—A faint bruit could be detected just above the iliac crest. Patient said that the throbbing was constantly perceptible to himself. Although much enfeebled, he preferred to leave his bed, saying that he obtained greater ease when sitting in a chair supported by pillows.

February 14.—Patient was so weak and in so much pain that he was compelled to lie down.

February 16.—The tumour, increasing day by day, had become most prominent in the right hypochondrium.

February 18.—Patient was so greatly prostrated that it was thought probable that some internal hæmorrhage had occurred. He rallied from this attack, but was afterwards very anæmic.

February 20.—Patient fainted in the evening and never really rallied. He sank gradually, and died on February 21, 1856.

Post-mortem Examination.

Integuments of light yellow hue ; abdomen enlarged.

Thorax.

Pleural adhesions at both apices.

Lungs.—Very congested. Left lung considerably compressed by a large amount of yellow fluid in the pleural sac, and by the bulging upwards of the aortic aneurysm in the abdomen.

Heart.—Normal.

Abdomen.

Clotted blood was found in the peritoneal sac, confined, for the most part, to the upper part of the cavity.

The hæmorrhage had proceeded from a ruptured aneurysm. The aneurysm arose from the upper part of the posterior wall of the abdominal aorta, and communicated with that vessel by means of a large oval opening with well-defined edges. The sac was about the size of a cocoanut, and extended backwards and to the left, separating the vessel from the vertebral column for a considerable distance. The sac also extended slightly to the right of the middle line for a distance of about 2 inches.

The aneurysm had very greatly eroded the bodies of the two last dorsal and two upper lumbar vertebræ. which formed part of the posterior wall of the sac.

The sac contained a large quantity of recent blood-clot, but the left and outer parts of its walls were completely destroyed, and its contents were continuous with a similar mass of blood-clot which lay in the substance of the muscles at the back of the abdomen as far down as the crest of the ileum. The fascia attached to the crest of the ileum had given way in one part, and a quantity of blood had escaped into the general cavity of the peritoneum.

The Inferior Vena Cava was considerably pushed forward and to the right by the aneurysm.

The Spleen was large, soft, and adherent to the diaphragm.

The Stomach, Pancreas, and Left Kidney were pushed forward by the aneurysm.

Other organs normal.

CASE VI.

The patient, a man aged sixty-nine years, was admitted to the hospital on March 3, 1858, under the care of Dr. Pitman.

He had suffered, for about sixteen months, from cough, shortness of breath and pain in the chest. There had also been a certain amount of œdema of the legs. During the summer months he had been better, but towards the close of 1857 his old symptoms had returned, and he had attended the hospital as an out-patient for about eight weeks. At this time patient's cough was very severe, but there was no dropsy. This came on about five weeks later.

On Admission.—Patient was in a state of great distress from dyspnœa and cough, with expectoration of a thin, frothy mucus.

Heart's action irregular; systolic murmur at base. Pulse feeble. Urine plentiful in quantity and containing a moderate amount of albumin. Patient was treated as an ordinary case of renal disease with failing heart. He eventually died on March 3, 1858.

The existence of an abdominal aneurysm was never suspected. The patient never manifested any symptoms of that complaint while he was in hospital, nor did he give any history of such symptoms.

Post-mortem Examination.

Considerable œdema of lower limbs and scrotum.

Thorax.

Heart very large and greatly hypertrophied. Valves normal.

Aorta much enlarged and extensively atheromatous throughout the thorax. The atheroma was calcareous in places. No aneurysm in thorax.

Left pleural cavity contained large quantity of serous fluid, which had greatly compressed the lung. The lung was in other respects normal. The right pleural cavity was obliterated by old adhesions. The right lung was œdematous.

Abdomen.

Just below the pillars of the diaphragm, was a large aneurysmal tumour of the abdominal aorta.

The tumour was situated at the root of the cœliac axis, and communicated with the aorta by an opening about the size of a half-crown which was practically obstructed by coagula. The sac was nearly filled with laminated clot, except in the centre, where the coagulum was softer. The three branches of the cœliac axis opened from the distal extremity of the tumour, which was about the size of a closed fist.

The sac had pressed upon the bodies of the vertebræ, on either side of the aorta. There was a small patch of erosion on one of the vertebræ. The pancreas was raised by the tumour, and the left renal vein crossed the artery just below it.

Just below the mouth of the sac was a small pouch, occupying the situation of the origin of the superior mesenteric artery.

The whole of the aorta was much dilated and very atheromatous.

The Spleen was small and congested.

The Left Suprarenal Capsule was raised by the tumour.

The Kidneys were granular.

There was a considerable amount of fluid in the peritoneal cavity. The other organs were healthy.

CASE VII.

The patient, a man aged thirty-one years, a printer's reader by occupation, was admitted to the hospital on December 23, 1863, under the care of Dr. Pitman.

The patient was a man of superior education, who had formerly been in good circumstances. He complained of long-standing pains down the backs of his thighs, especially the left, with weakness and pain of the lumbar and gluteal muscles. For two years, he had sought relief from this pain, which had been regarded as sciatica and had been treated with a great variety of drugs including arsenic.

On Admission.—Patient was not much wasted, nor had he the appearance of one suffering from very acute pain.

He was treated at first with iodide of potassium and morphia, then with stramonium and quinine in pill, and with the injection of ½ grain of morphia into the left hip every night. From these measures he obtained much temporary relief.

January 2, 1864, patient complained of abdominal pain. The bowels, generally confined, were kept open with castor-oil. A fomentation was applied to the abdomen.

No suspicion as to the true nature of the case ever arose, and the case, 'falling into the class of chronic affections,' was not carefully watched. The man's decline appears to have been gradual.

January 6, patient complained of pain in the left hip and groin and died shortly afterwards, somewhat unexpectedly.

Post-mortem Examination.

Body much emaciated.

Thorax.

Left pleural cavity contained a little blood-stained serum.

Lungs and Heart.—Normal.

Abdomen.

On the abdomen being opened, black blood-clot was seen lying in the abdominal wall, outside the peritoneum and within the various folds of peritoneum to which the bowels were attached.

An aneurysm rather larger than a cricket-ball was discovered, arising from the abdominal aorta opposite to the first lumbar vertebra. In front the sac was lined by the arterial wall, but posteriorly it was formed entirely by neighbouring structures. The aneurysm lay entirely behind the peritoneum. The sac had ruptured in a somewhat indefinite manner by the giving way of its postero-lateral wall on the left side. The blood had made its way behind the peritoneum, which was unbroken, and had been directed forwards into its foldings.

All viscera normal.

CASE VIII.

The patient, a woman aged forty-six years, a charwoman by occupation, was admitted to the hospital on August 23, 1865, under the care of Dr. Page.

Patient was a widow, who had been in the hospital some months before for abdominal pain—‘spasms,’ as she expressed it—and backache. These symptoms had lasted for an indefinite time, recurring paroxysmally. The last attack had occurred about Christmas, 1864.

Patient stated that, for a week before her admission, she had had frequent vomiting and that her bowels had not been opened for five days. The period of constipation had been preceded by an attack of diarrhœa lasting for several days.

On Admission.—Rather prostrate. Tongue furred. Belly uniformly tumid.

An oil enema was administered and produced one loose motion.

August 29.—Bowels kept open by purgatives. Abdominal and wandering pains.

September 6.—Bowels regular and natural in action. Abdominal parietes soft and yielding.

Patient had for some time refused to take her medicine, and still complained of ‘ spasms ’ and vague pains. She was about to go home, having been discharged at her own request, when she suddenly became cold and collapsed and died slowly after some hours.

The condition was not diagnosed.

Post-mortem Examination.

Body in good condition.

Chest.

Old pleural adhesions.

All organs normal.

Abdomen.

Very large extravasation of blood behind the peritoneum, extending along the whole length of the abdominal aorta. This hæmorrhage had proceeded from a large round hole which led into an aneurysm of the abdominal aorta, situated at the left side and back part of the vessel, occupying about two-thirds of its circumference. The lower edge of the aneurysm was 3 inches above the bifurcation of the vessel.

The sac could scarcely be said to exist. The hole described led into a large, irregular cavity lying in the areolar tissue behind the left kidney. Close to the opening were the broken remnants of a sac wall covered with loose laminated coagulum. The space behind the peritoneum was full of black clot.

The **Aorta** showed scattered patches of atheroma throughout its course.

All organs normal.

CASE IX.

The patient, a man aged thirty years, a carpenter by trade, was admitted to the hospital on November 21, 1866, under the care of Mr. Hewett.

He stated that four years before admission he had fallen from a height of 15 feet, injuring his left shoulder. Three years later he had had pain in the small of the back. More than two months before admission, patient had had pain in left side, extending to hip, groin and knee. During the five weeks previous to his admission, the pain had made him limp, and his bowels had been constipated. Recently he had had three attacks of shooting pain, extending from the hip to the leg, accompanied by twitching, spasms and dysuria.

On Admission.—Tenderness on percussion over the last lumbar vertebra and the sacrum. The upper spines of the latter were irregular and very tender. In the left inguinal region was a hard, tender and painful swelling. Tenderness and pain all over the lower part of the left lumbar region.

November 29.—Swelling decreased in size.

January 18, 1867.—Patient became suddenly faint at about 1 p.m., and died at 2.25 p.m.

Post-mortem Examination.

Body in good condition.

Thorax.

Lungs.—Collapsed and anæmic.

Heart.—Normal.

Aorta.—Slightly atheromatous.

Abdomen.

Large quantity of coagulated blood in peritoneal cavity.

All abdominal viscera normal.

In the left lumbar region, and extending down into the left iliac fossa, was an enormous aneurysm, in front of which lay the left kidney and the descending colon. The walls of the sac were, for the most part, formed by consolidated neighbouring structures and posteriorly by the bodies of the vertebræ and the lower ribs, which were extensively eroded. The sac communicated with the abdominal aorta by an orifice about the size of a shilling, situated in the posterior wall of that vessel. The sac had ruptured through a rent in its posterior wall. The bone in the left iliac fossa was exposed, but the sacro-iliac joint was sound.

CASE X.

The patient, a man aged forty, a labourer by occupation, was admitted to the hospital on April 15, 1868, under the care of Dr. Barclay.

He had suffered from pain across the abdomen and back for eight months. The pain was worse after food. No vomiting. No history of injury.

On Admission.—Distinct area of pulsation below sternum, over a very limited part of which an aneurysmal bruit was audible.

Treatment :

Plumb. acet.	gr. iii.
Pulv. opii	gr. ss.

F. pil. t.d.s.

Patient suffered a good deal from constipation.

At the end of May there was an increase in the pain, accompanied by faintness, and soon after this, patient began to complain of pain down the right leg.

By June 10, the right leg was almost useless, and there was much fulness and hardness in the right iliac fossa. Patient had become very pale and was much thinner than he was when admitted to hospital.

Condition remained much the same up to 5 a.m. on June 19, when patient was seized with pain in the abdomen, which caused him to cry out loudly. He then became unconscious and died shortly afterwards.

Post-mortem Examination.

Body very pale ; lips blanched.

Thorax.

Lungs.—Very œdematous ; congested posteriorly ; extremely emphysematous in front. Emphysema more marked in right lung than in left.

Heart.—A few specks of atheroma on mitral valve, otherwise normal.

Aorta.—Extremely atheromatous ; quite rigid, and covered by dense masses of atheroma, some of which was calcareous. Slight dilatation immediately above aortic valves. On the descending thoracic aorta, opposite to the fourth dorsal vertebra, was a small pouch about the size of half a walnut arising from the posterior wall and caused by a bulging of all the coats of the vessel ; the lining membrane completely covered the inside of the sac. Immediately above this sac was a second pouch, not so distinctly marked as the former, but which had extensively eroded the body of the fourth dorsal vertebra to which it was adherent.

Abdomen.

Liver.—In a state of advanced cirrhosis ; hard, much diminished in size and irregular on the surface.

Kidneys.—Early state of granular degeneration.

Spleen.—Normal.

Lying on the right side of the fourth lumbar vertebra, was an aneurysm about the size of a cricket-ball. It communicated with the abdominal aorta by a rounded opening in the posterior wall of that vessel, situated just below the origin of the inferior mesenteric artery. The greater part of the wall of the sac was formed by surrounding tissues which had become consolidated, and posteriorly, by the bodies of the third, fourth and fifth lumbar vertebræ which were extensively eroded. The sac contained a small amount of laminated clot and had ruptured into the subperitoneal tissues of the right side.

CASE XI.

The patient, a man aged twenty-nine years, an organist by occupation, was admitted to the hospital on June 24, 1871, under the care of Dr. Wadham. The patient had been sent up from the country. He complained of great pain in the right side, extending down the thigh, which had been attributed to rheumatism.

He was in a state of great excitement and no further history could be obtained. On examination, there was no tenderness of the abdomen on pressure, nor was any tumour perceptible. About eight o'clock the same evening, the patient suddenly became much worse, the pain being extremely severe. He rapidly sank into a state of collapse, and died at 2.20 a.m. on June 25, 1871.

Post-mortem Examination.

Body much blanched, but well nourished. Height, 5 feet 8 inches.

Thorax.

Pleura.—A few old adhesions on both sides.

Lungs.—Right, congested and œdematous ; left, congested.

Heart.—Small, circumscribed, thickened patch on the pericardium in front of right ventricle ; otherwise normal.

Aorta.—Intensely atheromatous.

Abdomen.

Large quantity of blood-stained fluid and recent blood-clot in peritoneal cavity.

A large aneurysm arising from the posterior wall of the abdominal aorta, just below the origin of the cœliac axis. The sac communicated with the aorta by an orifice about the size of a florin. The aneurysm partially occupied the left hypochondriac region, and completely filled the left lumbar and inguinal regions. It was limited below by Poupart's ligament. A smaller sac, about the size of a hen's egg, lay to the right of the spine, and communicated with the larger sac by a large opening. The sac contained coagula of varying colours, but of apparently recent formation.

The bodies of the last dorsal and first lumbar vertebræ were deeply and extensively eroded ; the intervertebral discs were intact. The left psoas muscle was in great part absorbed.

Liver.—Fatty.

Other organs normal.

CASE XII.

The patient, a man aged thirty-five years, a gardener by occupation, was admitted to the hospital on October 25, 1871, under the care of Dr. Barclay. Since March, 1871, patient had had pain in the lumbar region. Six weeks before admission he had first felt 'a kind of palpitation at the pit of the stomach,' which had been gradually getting worse. The pain generally came on in paroxysms, feeling to him like 'the wind.' Patient had had no accident.

On Admission.—Rather thin and pale, complained of some pain in epigastric region, which was much relieved by pressure. Heart-sounds clear and normal. Below the sternum and a little to the left of the middle line, was an area about the size of the palm of the hand, which could be felt to pulsate strongly. The pulsation was distinct from the impulse of the heart. Percussion resonance was absent all over the region of pulsation, and no bruit could be heard.

Treatment :

Plumbi acetatis	gr. iii.
Opii	gr. $\frac{1}{4}$.

F. pil. t.d.s.

October 27.—Colic-like pain in abdomen. Pulsation unaltered; pill omitted.

December 2.—Pill resumed. Ol. Ricini ℥ss. p.r.n. ordered.

December 15.—Area of dulness seemed to have increased. Pulsation not so distinct. Much pain in back.

December 26.—Good deal of vomiting. Pain in back. Hydrocyanic acid and morphia.

December 30.—Pain in back worse; hardly any sleep.

January 27.—Patient gradually got weaker. Pain and pulsation unaltered. Died suddenly while having breakfast.

Post-mortem Examination.

Body extremely anæmic. Height, 5 feet 7½ inches.

Thorax.

Pleura.—Right, a few adhesions at apex; left, firm adhesions at base. Cavity contained large quantity of blood-stained serum and recent clot. This blood was found to have come from a rupture about the size of a shilling in an aneurysmal sac connected mainly with the thoracic aorta. The aperture was at the back and extreme base of the pleural cavity. It lay behind the lung which was adherent to the aneurysmal sac, immediately in front of the opening in the pleura.

Lungs.—Right, normal; left, compressed and almost devoid of air.

Heart.—Round patch of thickened pericardium on anterior surface of right ventricle; organ otherwise normal.

Aorta.—Generally greatly thickened, owing to large patches of atheroma which were for the most part soft, though some had become calcareous. The thoracic aorta, commencing from the upper border of the ninth dorsal vertebra, was dilated into a large fusiform aneurysm. It was firmly adherent to the bodies of the ninth, tenth, eleventh and twelfth dorsal and first lumbar vertebræ, which were deeply and extensively eroded.

Abdomen.

At the aortic opening in the diaphragm, the aorta was to a slight extent dilated. Below the opening, it became again dilated into a round pouch about the size of an orange over which the left lobe of the liver was spread out in a thin layer. Below the sac, lay the pancreas and duodenum, and from it hung a portion of the mesentery containing dilated lymphatics matted together and filled with chyle. The vessels of the cœliac axis were given off from the lower part of this aneurysmal sac. The aneurysm, below the diaphragm, was not adherent to the vertebræ, and was freely movable in the abdominal cavity; the whole sac was filled with a reddish-brown coagulum.

The other organs were normal.

CASE XIII.

The patient, a man aged twenty-five years, a sailor by occupation, was admitted to hospital on September 9, 1874, under the care of Mr. Holmes. Sixteen months before his admission, patient had first felt pain in his chest, and had had difficulty in expectorating phlegm. He had never spat up any blood. Shortly after this, he had had pain in the lumbar region and in the left hip. He had never been lame, but stooping caused him pain. No family history of consumption.

On Admission.—Pale, unhealthy-looking man, complaining of great pain across the lower part of his back and across the region of his stomach. Apparent lack of mobility of lumbar vertebræ, which did not move at all when patient stooped. Not much tenderness in lumbar region. Slight swelling in left groin. Abdominal muscles kept very tense.

Treatment: Fish diet and purgation.

September 15.—Pain in left shoulder and hip. Pain in back and abdomen unaltered. Abdominal muscles still tense.

September 19.—Pain in back and abdomen increased. From this date onwards the patient suffered great pain which was relieved by morphia. The pain was especially marked in the abdomen, where it took the form of cramp, causing the patient to double himself up.

He gradually got weaker, and died at 5.15 p.m. on October 9. This patient was thoroughly examined several times, especially with regard to the condition of the abdominal aorta, and nothing was discovered. The stethoscope was used and not even a bruit could be detected.

Post-mortem Examination.

Body well nourished. Height, 5 feet 5 inches.

Thorax.

Universal firm adhesions of left pleura. Both lungs congested and œdematous.

Heart.—Normal.

Aorta.—Large patches of soft atheroma at commencement. Remainder of thoracic aorta slightly atheromatous.

Abdomen.

Large quantity of recent blood-clot in gastro-hepatic omentum. A smaller amount of clot in great omentum.

Aneurysm the size of two fists arising from front of left side of aorta, and communicating with that vessel by an orifice which admitted five fingers. Posterior wall of sac formed by bodies of tenth, eleventh, and twelfth dorsal and first two lumbar vertebræ which were deeply eroded. The intervertebral discs were intact. The sac contained about 1 pound of clot the greater part of which was laminated. Aneurysm had ruptured by a small triangular rent close to the spine. The whole of the abdominal aorta was very atheromatous, some of the patches having attained to the calcareous type.

All other organs normal.

CASE XIV.

This patient, man aged thirty years, a butler by occupation, was admitted to the hospital on December 22, 1875, under the care of Dr. Wadham. The patient stated that he had had an illness similar to the present in October, 1874.

The history of his present illness was that he had had pain across the loins for the last six months ; that two months before his admission, his urine had been loaded and difficult to pass ; also, that since then, the pain had extended down to the postero-internal aspect of the thighs.

On Admission.—Pale ; pain as above described : tongue clean ; bowels constipated.

Some hardness of abdominal muscles. To left of umbilicus, a large tumour with somewhat rounded edges, extending into left iliac fossa. There was distinct expansile pulsation in the tumour and a loud bruit was audible all over it.

There was tenderness of the upper part of the lumbar spine on pressure, and jarring the spine or tapping the top of the head produced pain in the back and in the tumour.

Treatment: Purgatives and morphia draught at night. Fluid diet.

December 24.—Much pain down inside of thighs. Bowels had been fully opened; the tumour could be felt rather more distinctly and seemed to extend not quite so far downwards. A diagnosis of aneurysm having been made, patient was ordered—

Plumbi acetatis	gr. ii.
Acidi acetici	♏x.
Tinct. opii	♏x.
Aquam	ad ℥i.ss.

Bis in die.

At this time and afterwards, distinct fluctuation was felt in the tumour. The bowels were inclined to be constipated, and patient was pale and looked anxious.

January 6, 1876.—Tumour less pulsatile. No pain down inner sides of thighs. Margin of tumour indistinct. Slight cough, with expectoration of a small quantity of rusty, viscid sputum. Pulse small, thready; 96.

January 13.—Pain and stiffness in left shoulder. Tumour extended from umbilicus in front to spine behind, and from 1 inch below tenth rib to crest of ilium both in front and behind on left side. Soft systolic murmur heard all over tumour which was tender and fluctuated.

January 20.—Patient weaker. Expectoration muco-purulent and streaked with blood. Tumour unaltered.

January 27.—Patient had had pain in left leg for two days, had been getting gradually weaker and, from time to time, had been wandering and ‘light-headed.’ He died quietly at 6 a.m.

Post-mortem Examination.

Body much emaciated.

Thorax.

Pleural Membranes firmly adherent to lower lobes of both lungs.

Lungs.—Upper lobes slightly congested ; lower lobes œdematous.

Heart.—Normal.

Abdomen.

On opening the abdomen, the stomach was found to be lying transversely, the smaller curvature being opposite to the ninth left costal cartilage, while the larger curvature was on a level with the umbilicus. The transverse colon lay below the stomach and was considerably contracted. The pancreas lay behind the stomach, pushed forward by and resting on, a large tumour. The left kidney was visible beneath the colon and, relatively, the organs were in their natural positions.

The tumour, referred to above, was found to be a very large aneurysmal sac arising from the aorta near the cœliac axis. The sac communicated with the aorta by an oval orifice 1½ inches by 1 inch in dimensions. The sac extended, on the left side, almost to the pelvic cavity ;

while on the right side it had displaced the right kidney and occupied its position, forming a tumour about three times the size of that organ. The sac was full of semi-fluid blood, its surface in parts being covered by thin layers of fibrin. The aorta was compressed to a great extent by the anterior surface of the tumour.

All the other abdominal organs were normal.

CASE XV.

The patient, a man aged thirty-one years, a carpenter by trade, was admitted to the hospital on March 12, 1879, under the care of Dr. Dickinson.

Family history presented no features of interest.

Patient had had strangulated hernia in 1874, and had suffered from occasional attacks of nausea ever since.

He had had pain in his loins for fifteen months before his admission to the hospital. This pain had been much worse during the nine months immediately preceding his admission. He had also suffered from constipation during this period.

Latterly, patient had suffered severe abdominal pain (not particularly localized) after taking food, and from abdominal distension at night. There had been no vomiting.

On Admission.—Emaciated and sallow. Temperature 100° F.

Chest apparently normal, excepting that apex beat was indefinite.

Abdomen neither distended nor tender.

Urine: Specific gravity, 1·036. Contained sugar, but no albumin.

March 17.—Pain only severe occasionally. No abdominal distension. Bowels open regularly. Temperature irregular, rising to 100·4° F. at night.

March 24.—Paroxysms of intense abdominal pain of irregular duration at irregular intervals. Bowels open. Pulse, 112. Respiration, 26. Temperature irregular, as before. Chest: Impaired resonance on left side. Occasional 'creak' audible. Abdomen: No distension.

March 25.—Pulse, 132. Respiration, 27. Temperature ranging from 98·4° to 101° F. Some abdominal tenderness. Bowels confined.

March 26.—No fresh symptoms. Patient died quietly.

Post-mortem Examination.

Body thin. Height above average.

Thorax.

Right Lung.—Partially adherent, œdematous and imperfectly expanded.

Left Lung.—Reduced to very small size by pressure of large clot in pleura. The hæmorrhage had come from an abdominal aneurysm which projected upwards into the thorax, along the left side of the spine, and which had ruptured by two openings about as large as three-penny pieces.

Heart.—Normal.

Abdomen.

Liver.—Fatty.

Kidneys.—Slightly granular.

Spleen.—Soft. Light brown colour.

Intestines.—Normal, excepting for slight inguinal hernia.

A large aneurysm arose from the aorta, about 1 inch above the cœliac axis.

In shape, the sac of the aneurysm was bilobed; it communicated with the aorta by an orifice in the posterior wall of that vessel, measuring $1\frac{1}{3}$ inches by $\frac{5}{8}$ inch. Starting from the orifice, the aneurysm extended upwards, outwards and downwards, on either side of the aorta, into two large oval lobes. These lobes were connected, behind the aorta, by a narrow isthmus into which the orifice opened. The left lobe extended upwards by the side of the spine into the left pleural sac, and downwards to below the level of the twelfth rib. The right lobe extended upwards to the diaphragm, and downwards to about the same level as the left lobe. The aneurysm was rapidly approaching the surface in both loins below the ribs.

The sac of the aneurysm was chiefly formed by neighbouring structures. It had eroded the vertebræ on which it lay, and was adherent to the left lung. The aorta was only slightly atheromatous, and passed, without lateral deviation, in front of the tumour which sprang from it.

Case XVI.

The patient, a man aged thirty-three years, a coal-heaver by occupation, was admitted to the hospital on October 31, 1881, under the care of Dr. Whipham. The patient could give no history of any previous illness. He had been very healthy and in hard work as a coal-heaver, until seven weeks before his admission, when he began to feel aching in the lower regions after carrying heavy sacks. There was no sudden onset of pain; it was inconstant, sometimes acute, running neither upwards nor downwards. The pain was greatest on the right side of the lower dorsal vertebræ, but was felt also on the left side and in the umbilical region. No especially tender spot. Appetite fairly good. Bowels regular. No vomiting. The pain had always been increased by leaning forward. Patient had given up hard work six weeks before admission, but had been able to walk about slowly. The pain had been gradually increasing and had become more definite, especially in left flank. For two days before admission, patient had felt right iliac region to be getting very tender. His bowels had been constipated, but there had been no sudden exacerbation of pain. Patient had walked up to hospital, about half a mile.

On Admission.—Muscular man, complaining of dull lumbar pain and tenderness over the lower half of the right side of the abdomen. Muscles of right side of abdomen in state of permanent contraction. Complete loss of percussion resonance in right side of abdomen, from iliac fossa to level of umbilicus. Impaired but distinct resonance for about 2 inches below right costal margin. Left side of abdomen tender, but completely resonant. Much tenderness over lower dorsal vertebræ. No spot of acute tenderness found.

Heart and lungs normal. Bowels constipated.

Urine passed frequently without pain. Specific gravity, 1·010. Trace of albumin.

Treatment: Hot fomentations. Enema oleosum. Liquid diet. The bowels were opened once, next day, without pain. The abdominal tenderness became much diminished. The resonance in the right hypochondrium increased. There was no diminution in the area of dulness and its limits remained indefinite. Patient was very weak, but took his liquid diet without discomfort. Pulse 82, very easily compressible. On the night of November 3 there was very considerable increase of pain in right lumbar and iliac regions. The pain also extended to the left iliac fossa, with acute superficial tenderness.

Above and behind the right iliac crest there was slight visible pulsation and ill-defined ecchymosis. Pulse 132, weaker. Bowels opened painlessly after a second enema. Patient slept quietly on the night of November 4, after morphia draught ; awoke about midnight in no great distress, drank some milk, and died suddenly ten minutes later.

Post-mortem Examination.

Body well nourished. Height, 5 feet 7 inches.

Thorax.

Lungs.—Healthy.

Heart.—Healthy. Hypertrophy of left ventricle.

Abdomen.

Peritoneal cavity contained much 'sanious fluid.'

Aneurysm about the size of an orange arising from the abdominal aorta, just below the origin of the cœliac axis. The posterior wall of the sac was formed by the bodies of the last dorsal and first lumbar vertebræ which were deeply eroded. The aneurysmal sac was partially lined with firm fibrous clot. It had ruptured at its anterior and right surface ; stellate rupture, about the size of a sixpence. The blood had passed behind the peritoneum and in front of the right kidney, pushing forward the ascending colon, and separating the peritoneum from the abdominal wall.

Atrophy of right kidney.

All other organs normal.

CASE XVII.

The patient, a man aged thirty-nine years, a clerk by occupation, was admitted to the hospital on November 15, 1882, under the care of Dr. Whipham.

Patient had been a sailor for sixteen years—1864-1880—then had taken to clerk's work. Up to Christmas, 1881, he had had excellent health; no rheumatism, syphilis, malaria or other illness.

About Christmas, 1881, patient began to feel abdominal tenderness and hardness. The bowels also became very constipated. After the bowels had been opened by purgatives, patient felt nearly well again. Similar pain extending to the loins came on in September, 1882, and never completely left him. Patient was very sleepless, and became an out-patient October 20, 1882. The pulse was then 150. The pains were erratic and were chiefly felt over the sternum and in the left side. No bruit heard nor tumour felt. Belladonna plaster was applied and purgatives given, but the pain was not relieved. Pulse continued to be very rapid, seldom falling below 120. In spite of treatment directed to relieve it, patient continued to be troubled by insomnia, and he was recommended for admission.

On Admission.—Sallow man with black hair, looking older than his years. Pulse 144, small. No cough. Tongue thickly coated.

Heart-sounds loud and clear; action regular but rapid.

Liver and spleen apparently normal.

Epigastric region dull on percussion. Recti rather tense. Somewhat 'boggy feeling.' No distinct tumour found.

Urine normal.

Patient complained of aching across the loins and over the upper part of the abdomen. Bowels had not been opened for two days.

Treatment: Pil. hydrarg. cum rheo (gr. x.). Liquid diet.

Patient complained of pain across the loins, but slept about three hours during the night. In the morning (November 16) patient said that he felt comfortable, and was reading a book, when at 1 p.m. he became suddenly convulsed (no cry); the right arm was contracted; the general position was opisthotonic. In less than a minute he was dead.

Post-mortem Examination.

Height, 5 feet 5 inches. Body thin.

Thorax.

Pleura.—Left cavity filled with blood-clot and serum.

Lungs.—Left, partially compressed, tough, floated in water; right, congested.

Heart.—Displaced to right of sternum. Free edge of mitral valve thickened.

Aorta.—Atheromatous throughout.

Abdomen.

Aneurysmal sac the size of a tennis-ball arising from the left side of the abdominal aorta at the junction of the thoracic and abdominal sections of the vessel. Oval communication with the vessel ¾ inch long by 1½ inches wide. The sac lay by the left crus of the diaphragm and had burst into the left pleural cavity, the aperture in the sac being about the size of a pea.

None of the vertebræ eroded.

Kidneys.—Fatty change.

Other organs normal.

CASE XVIII.

The patient, a man aged forty-five years, a stableman by occupation, was admitted to the hospital on March 15, 1883, under the care of Dr. Whipham.

He had served in the Marines until 1857, and since then had worked as a stableman. Had 'fever and ague' in China in 1855; no serious illness since then. Had been in the habit of drinking large quantities of beer. No definite history of syphilis. No history of rheumatism.

In the autumn of 1882 patient 'began to feel a weight in the stomach,' and had occasional attacks of pain. This pain became nearly constant; it was not increased by food, but was aggravated by constipation which was frequent and necessitated much purgative treatment. For two months before admission, patient's greatest annoyance had been frequent attacks of hiccough, which gave him diaphragmatic pain and palpitation of the heart. Patient had continued to work as stableman till a week before admission.

On Admission.—A heavy-looking man with dusky hue of face and congested facial capillaries. He complained of hiccough and much pain and sensation of weight in epigastric region. Pulse 90, easily compressible.

Heart: Dulness displaced downwards and continuous with a pulsating mass palpable in the epigastrium. This mass lay mostly to the left side, and distinct lateral pulsation could be felt in it. Slight systolic bruit audible over fifth left intercostal space, but nowhere else. No tenderness either in the abdomen or over the spine.

Urine: Specific gravity, 1·032. Heavy precipitate of urates. No albumin.

Patient suffered least pain when sitting up and bending forward. Hiccough most severe when patient lay down. He took liquid food without feeling pain, but vomited frequently and slept badly.

Early on the morning of March 16 sudden collapse supervened, and patient died in a minute or two.

Post-mortem Examination.

Height, 5 feet 10 inches. Body thin.

Thorax.

Lungs.—Congestion of posterior borders; otherwise healthy.

Heart.—Thickening of mitral valve. Hypertrophy of left side. All valves competent.

Aorta.—Atheromatous throughout.

Abdomen.

Large quantity of blood-clot in peritoneal cavity. Arising from the anterior wall of the aorta, just above the origin of the cœliac axis, was a large globular aneurysm about the size of a lemon. It communicated with the artery by a circular orifice about 1 inch in diameter. Wall of sac thin. Small quantity of laminated clot in sac. Slit-like rupture of anterior wall of sac.

Liver.—Fatty.

Other organs normal.

CASE XIX.

The patient, a man aged thirty-nine years, a gardener by occupation, was admitted to the hospital on October 3, 1883, under the care of Dr. Wadham. No history of syphilis or alcoholism. Patient had been a gardener since boyhood and, until 1880, had had very good health.

In 1880, he began to have pain in the epigastrium and abdomen. This pain he attributed to a 'twist' which he had felt while lifting a heavy spadeful of earth. The pains were variable and accompanied by throbbing. They were increased by exercise, but patient had been able to do his work till a fortnight before admission. During that fortnight, he had been confined to his bed, where he had been obliged to sit up in order to relieve the constant gnawing pain in his abdomen.

On Admission.—A fairly well-nourished man, with flushed face and anxious look. Patient preferred to sit up in bed, and complained of much pain in the epigastric and umbilical regions. Pain passed up to right shoulder and small of back. Pulse weak (70).

Heart: First sound slightly blurred at apex; otherwise normal.

Large rounded pulsating tumour occupying the whole of the epigastric region and extending downwards as far as the umbilicus. Tumour projected slightly and was very tender. Over a small portion of it a faint systolic murmur was audible.

Patient was given morphia and thus obtained sleep. After a few days, the pulsation and pain caused by the aneurysm was much diminished.

From October 15, 1883, to January 4, 1884, patient was treated with potassium iodide and restricted diet —10 ounces of solid food and 10 ounces of liquid in the day. He bore the treatment well, and by the end of December, 1883, the aneurysm was slightly reduced in size, and the pulsation was only palpable over an area that might have been covered by a crown-piece. Temperature remained normal up to January 7 ; then patient had a rigor. Respiration and pulse grew rapid. Cough set in, with great pain in right shoulder and small of back. There were fine crepitations throughout the right lung, and rusty sputum. Patient sank rapidly, with high fever and very painful cough, and died early on the morning of January 15, 1884.

Post-mortem Examination.

Height, 5 feet 6 inches. Body fairly nourished.

Slight icteric tinge about neck and upper part of chest.

Chest.

About 20 ounces of blood-stained fluid in left pleural sac.

Left Lung.—Upper lobe, on section, very red colour in posterior portion. Lower lobe collapsed, sinking in water.

Right Lung.—Very œdematous.

Heart.—Hypertrophy of left ventricle ; otherwise normal.

Aorta.—Atheromatous.

Abdomen.

An aneurysmal sac as large as fœtal head arising from upper part of abdominal aorta. Sac filled in part with decolourized laminated clot ; in part with red blood-clot.

Sac and contents weighed 6 pounds.

Front of bodies of twelfth dorsal and first and second lumbar vertebræ eroded. Cartilages intact.

Spleen.—Seventeen ounces ; soft and pulpy.

Kidneys.—Greatly congested ; otherwise normal.

Other organs normal.

CASE XX.

The patient, a man aged twenty-five years, a greengrocer by trade, was admitted to the hospital on August 1, 1881, under the care of Dr. Dickinson. Patient had never had rheumatism or syphilis. Had had no hard labour or sudden strain, though he had been exposed to the weather a good deal while carrying round his wares. He had always been strictly temperate, and his family history was good.

On July 29, 1881, while carrying round his goods, he was attacked by sudden sharp pain in the back and abdomen, which was intermittent and griping in character. There was no vomiting, and he experienced relief from pressure applied to the abdomen.

On Admission.—Healthy-looking man. No sickness or diarrhœa. No headache. Temperature, 100·4° F.

Heart's action irregular. Sounds both reduplicated. No murmur. Nothing else of abnormal character.

Pulsating tumour about the size of a small orange just above and to the right of the umbilicus. Pulsation expansile, corresponding to cardiac systole.

Aneurysm of abdominal aorta diagnosed.

Patient was treated with greatly restricted diet and fluids, and with 20-grain doses of potassium iodide, three times a day. He bore the treatment well, and on August 15 all pain had gone, while the pulsations of the tumour were greatly decreased. The heart's action had also become absolutely normal. The patient continued to improve under the treatment till October 17. On that date there was but slight pulsation in the tumour, which had considerably diminished in size and felt much harder. On November 15, patient was allowed to get up. No adverse symptoms resulted, and on December 17 he left the hospital.

The patient was able to do light work as a greengrocer, without difficulty, till April 14, 1882, when the aneurysmal symptoms rapidly returned. On readmission to hospital, it was found that the firm tumour had again become elastic and pulsating, and that it was much larger than when patient was first admitted. He was treated for four months with rest in bed, restricted diet and potassium iodide, and improved greatly ; but the condition of the tumour was not so satisfactory as when the patient left the hospital in 1881. He returned to work, however, as a carman, and was able to work till April 16, 1883, when he was readmitted under the care of Dr. Wadham, for a return of the aneurysmal symptoms similar to that of the former year. He slowly improved under the treatment already mentioned, and again returned to his work as carman.

On January 14, 1884, he was attacked again by sudden sharp pain in the abdomen, and was readmitted to hospital on January 26. It was found that the area of palpable pulsation extended from the xiphoid cartilage to below the umbilicus, the bruit being remarkably confined to the upper part of the tumour. The same treatment as before restored the patient to what he described as perfect health, but he was unable to do any work after his discharge from hospital. The pain in the back gradually increased, and vomiting after food became constant. The patient was readmitted to hospital on June 3, 1884. There was some ventral pain and nausea, and the pulse was intermittent. After two days. patient's liquid diet was reduced to 8 fluid ounces, and he was given potassium iodide (gr. xx.) three times a day. During the month that followed, the pain was much greater than it had been before, and was felt both in the back and in the tumour. But, at times, patient was quite comfortable for several days together. No symptoms of intercurrent disease appeared, nor did the aneurysm appear to be extending. On July 8, patient had been very comfortable up to 7 p.m., when he suddenly became pale and collapsed. Opium was given. Patient rallied a little and became very restless and excitable, the pulse throughout being hardly perceptible. After several fits of extreme faintness alternating with great weakness, patient eventually died at 10.20 p.m.

Post-mortem Examination.

Body fairly nourished.

Thorax.—All organs healthy.

Abdomen.—In the left side of abdomen, lying underneath the peritoneum, was a large quantity of blood-clot. From the abdominal aorta there arose two aneurysmal sacs.

(1) Arose from the front of the vessel, just above the bifurcation. It was entirely filled by decolourized laminated clot.

(2) Arose just above the former. It was an irregularly-shaped sac projecting rather to the left, and had ruptured at the left side.

Other organs healthy.

CASE XXI.

The patient, a man aged thirty-nine years, a policeman by occupation, was admitted to the hospital on February 19, 1885, under the care of Dr. Wadham. Patient had had syphilis sixteen years before admission, and jaundice ten years before admission. On May 12, 1876, he had an *accident* to his back, which laid him up for six weeks. Patient suffered from pain in the back during the latter part of 1876, and applied for admission to the hospital; but as no cause for the pain was discovered, he went away again. From 1876 till about six weeks before his admission to hospital, patient suffered little if any pain; but about six weeks before he came to hospital he noticed a hardness in the abdomen, which hardness subsequently became pulsatile. Patient had been losing flesh for past six months. Family history good.

On Admission.—Strong, well-nourished man, showing signs of slight recent loss of flesh.

Chest: Nothing abnormal found.

Abdomen: Pulsating tumour extending downwards for 4 inches from ensiform cartilage; 3 inches across at broadest diameter. Pulsations expansile and visible. Systolic bruit heard over whole of tumour, but inaudible over spinal region behind.

Urine: specific gravity, 1·032. Trace of albumin.

The patient was kept in bed and treated with restricted food and fluids. The pain practically left him, and the tumour became harder and pulsated somewhat less. On July 1 he was sent to the Convalescent Home. There he remained till August 5, when he was discharged. While at the Home, he walked about and had much the same diet as the other patients. On the evening of his discharge patient went home in an omnibus, and during the night was seized with a severe attack of abdominal pain, which was followed by another attack next day. Patient felt so much worse that he came to the hospital, and was readmitted on August 7. Patient was in extreme pain, with blanched lips, feeble pulse and sweating skin. Temperature, 99·2° F. The limits of the tumour were less easily defined than they were before. Instead of being hard, the tumour was rather diffuse and seemed to be spreading to the right of the middle line. Bruit heard to right of umbilicus. Patient had frequent attacks of pain (partly relieved by morphia), alternating with periods of comparative comfort, till August 11, on which day at 2.30 p.m. he had an attack of pain which nearly killed him. He, however, rallied, but had another attack of pain at 7 p.m. and died quietly and gradually about thirty minutes after it.

Post-mortem Examination.

Powerful muscular man. Extensive bruising over lower half of abdomen.

Thorax.

Pleura.—Adherent on both sides.

Lungs.—Congested chiefly towards bases. Margins of both bases posteriorly compressed by mass of blood-clot, which had pushed up diaphragm.

Pericardium.—Contained 2 ounces of fluid.

Heart.—Left ventricle hypertrophied. Small nodules on aortic valves.

Aorta.—Atheromatous throughout its course.

Abdomen.

About ½ pint of blood-stained fluid in peritoneal cavity.

Aorta.—Immediately below the diaphragm, there was a large aneurysm about the size of a cocoanut. This aneurysm communicated with the aorta by an orifice 2 inches in diameter, situated in the anterior wall of the vessel, at the level of the origin of the cœliac axis. The sac of the aneurysm had eroded, and was adherent to, the left side of the body of the first lumbar vertebra. It was also firmly adherent to the cardiac end of the stomach, over an area of about 1½ square inches. The sac of the aneurysm was lined by laminated decolourized clot, to the thickness of about 1½ inches. Posteriorly and to the right of the tumour, there was an extensive laceration of its wall, through which a large quantity of blood had made its way into the retroperitoneal tissues, burying the kidney and raising the peritoneum from the subjacent structures to a very great extent.

The **Liver** was fatty.

The other organs were normal.

CASE XXII.

The patient, a man aged thirty-five years, a labourer by occupation, was admitted to the hospital on July 8, 1889, under the care of Dr. W. Ewart. No history of rheumatism or other illness obtained. Consumption of alcohol considerable, both beer and whisky. The patient said that he had been in good health till a month before his admission to hospital, when he began to suffer from abdominal pain and occasional attacks of vomiting. Appetite had been bad. Bowels had acted regularly.

On Admission.—Chest: Systolic and diastolic murmurs at base of heart. Nothing else abnormal found.

Abdomen: Tender. Pulsating tumour in epigastric region to left of middle line. Systolic bruit heard. Aortic aneurysm diagnosed.

On July 10 patient complained of pain in left side of back and abdomen. In the evening he suddenly became cyanosed and pulseless. After injection of ether, patient revived for a few minutes, but speedily became pulseless again and died.

Post-mortem Examination.

Well-nourished man.

Thorax.

Heart.—Normal, excepting for slight atheroma of aortic valves.

Aorta.—Slight dilatation at root. Whole of aorta, as well as large arteries, affected by soft atheroma.

Other organs normal.

Abdomen.

Large mass of blood-clot under the peritoneum on the left side. On removing clot, a collapsed aneurysm of the aorta, large enough to hold a fist, was found. The sac was adherent to the twelfth dorsal and first lumbar vertebræ, which were superficially eroded. The aneurysm involved the origin of the cœliac axis and superior mesenteric arteries. Rupture had taken place, below and to the left of the cœliac axis, through a hole large enough to admit the little finger.

Other abdominal organs normal.

CASE XXIII.

The patient, a man aged forty-seven years, a bootmaker by trade, was admitted to hospital on August 23, 1889, under the care of Dr. Cavafy.

The patient had had fairly good general health. No history of rheumatism, gout or syphilis. No family history of phthisis. Had been in the habit of taking alcohol in moderation. He had been feeling ill, on and off, for the past eight months. He was not able to press the boot he was making hard against his stomach, as had been his custom hitherto, on account of the pain it caused him. For more than six months he had had 'running pains' in the back and around the abdomen. He complained also of low spirits, increasing weakness and loss of flesh during the past six months. There was no pain or vomiting after food, but he used to retch much. He sweated freely at nights, had had a cough with expectoration of a small amount of thick bluish phlegm, for about seven weeks. He had never expectorated any blood. His bowels were usually constipated.

On Admission.—A dark, pallid man.

Heart: Apex beat in fourth left intercostal space, 1 inch internal to the nipple line. Some prolongation of first sound at apex. Otherwise normal.

Lungs: Physical signs suggesting fairly advanced tuberculosis at apices.

Much resistance in epigastric region. A pulsating mass felt below xiphisternum. Pulsation not distinctly expansile. Systolic bruit heard over pulsating area.

Next day the systolic bruit was no longer heard, and on August 26, the pulsating mass itself could not be found. On August 30, while the patient was being examined, he was suddenly seized with cramp-like pains in the left thigh, while the muscles in Scarpa's triangle were drawn up and knotted. The pain lasted for about half an hour, was succeeded by numbness of the thigh with impaired sensation, and he lay with his leg flexed to give him ease. Patient stated that since his admission to hospital he had had three similar attacks, but that none of them was as severe as the present.

Heart: Well-marked systolic murmur at apex, accompanied by peculiar squeaking bruit. Patient had another attack of pain similar to last, in the evening.

On August 31, a large oval mass, reaching from the costal margin down to the iliac fossa and extending inwards to within 2 inches of the umbilicus, was found in the left side of the abdomen. The mass was dull on percussion and pulsated, the pulsations being accompanied by a systolic murmur. About 1 p.m. patient was suddenly attacked by syncope, and called for some water. He rapidly became unconscious and died quietly a little after one o'clock.

Post-mortem Examination.

Well-nourished man. Rigor mortis present.

Thorax.

General pleural adhesions on left side and a few at right apex.

Lungs.—Advanced tuberculosis.

Pericardium.—Normal.

Heart.—Flabby ; otherwise healthy.

Aorta.—Healthy above and below aneurysm.

Abdomen.

No peritonitis.

Liver and **Kidneys** fatty. No lardaceous reaction.

Spleen pale and soft. No lardaceous reaction.

A large mass of blood-clot was found behind the peritoneum on the left side. The clot extended from the diaphragm above to Poupart's ligament below, and lay entirely behind the peritoneum. The blood had forced its way into the meshes of the ilio-psoas muscle, and had passed under Poupart's ligament as far down as the insertion of the muscle.

The **Abdominal Aorta** showed an aneurysm situated behind the cœliac axis. The sac was about the size of a small orange, and communicated with the aorta by means of an orifice about the size of a two-shilling piece in the posterior wall of that vessel. The bodies of the first and second lumbar vertebræ were adherent to the posterior wall of the sac and were superficially eroded. There was a rent in the left wall of the aneurysm large enough to admit the forefinger.

CASE XXIV.

The patient, a man aged twenty-eight years, a porter by occupation, was admitted to hospital on January 21, 1891, under the care of Dr. W. H. Dickinson. He had had fourteen or fifteen attacks of rheumatism during the twelve years previous to his admission. He had contracted syphilis which had not been treated, about eight years previous to his admission to hospital. The patient had first felt pain in the epigastric region about four months back, at which time he was laid up by some affection of the leg. For the past eleven weeks, the patient had been an inmate of Stepney Infirmary, where the medical officer had diagnosed aneurysm and had relieved the pain by means of amyl nitrate. There had never been any hæmoptysis, hæmatemesis or jaundice.

On Admission.—The patient was considerably emaciated. There was a well-marked syphilide on the arms and shoulders. The patient was in great pain and sought relief by ‘ doubling himself up.’

Heart: Apex-beat normal in position and character. Systolic murmur at apex. Loud blowing diastolic murmur heard over whole cardiac area. No second sound audible. Nothing else abnormal found.

Great pulsation plainly visible in the epigastric region. On palpation, a tumour about the size of an orange, pulsating in an expansile manner, apparently arising from the aorta about 3 inches below the ensiform cartilage, was discovered. A loud systolic bruit was audible over the tumour. Urine normal.

Patient was treated with iodides and restricted fluids. For about two months after admission, he seemed to improve and the aneurysm apparently decreased in size. On March 20, the patient became distinctly worse. He suffered from incessant pain of a 'shooting' character, chiefly situated in the back and shoulders. On March 23, the patient became jaundiced and the pulsation became much more marked. On March 25, bile-pigment appeared in the urine and the jaundice became deeper.

On March 26, patient had some hæmatemesis, passed a clay-coloured stool and died about forty minutes later.

Post-mortem Examination.

Thin body. Rigor mortis present. No scar visible on penis.

Thorax.

Organs of respiration normal.

Pericardium.—Normal.

Heart.—Hypertrophy of right side.

Aorta.—On posterior wall of ascending arch, midway between the orifices of the coronary arteries, was a small sacculated aneurysm $\frac{1}{3}$ inch in diameter. It was quite shallow with overhanging edges. Rest of thoracic aorta fairly healthy.

Abdomen.

Peritoneum.—Normal.

Alimentary Canal.—Stomach, duodenum and jejunum distended with clotted blood. On the left side of front part of duodenum was an opening of oval shape, about $1\frac{1}{2}$ inches in its longest diameter, leading into the sac of an aneurysm.

Liver.—Gall-bladder greatly distended. Common bile-duct pressed upon by aneurysm. Substance of liver bile-stained, otherwise healthy. Bile-ducts in substance of organ distended.

Pancreas.—Very hard. Head of organ pressed upon by aneurysm. Duct dilated and obvious as large thin-walled tube. Microscopically, pancreas showed interstitial inflammation and formation of new fibrous tissue between the lobules.

Spleen.—Normal.

Kidneys.—Bile-stained ; otherwise normal.

Abdominal Aorta.—Just above origin of cœliac axis, on anterior wall of aorta, was an opening about the size of a threepenny piece leading into a sacculated aneurysm about the size of a closed fist. Rest of vessel fairly healthy.

Vertebræ.—Not eroded.

Left renal vein compressed by aneurysmal sac to which it was adherent.

CASE XXV.

The patient, a man aged twenty-seven years, a cab-driver by occupation, was admitted to the hospital on October 28, 1891, under the care of Dr. Dickinson. Patient had suffered from scarlet fever and ‘ inflammation of the lungs ’ at the age of fourteen. No history of rheumatism. He had had influenza in March, 1891, since when he had been suffering from pain in the left side of the abdomen and back. This pain had gradually become worse ; so that he could not sit up straight. He had lost 28 pounds in weight during the two months preceding his admission to hospital.

On Admission.—Loud systolic murmur heard at apex of heart. Apex-beat not displaced outwards. Nothing further of abnormal character found.

Left rectus abdominalis kept tightly contracted. No tenderness on fairly firm palpation. Nothing further of abnormal character discovered. Patient complained of pain in back, from left shoulder to hip.

Eventually a diagnosis of spinal caries was made, and the case was transferred to Mr. Rouse on November 16.

After about a month's interval, slight rigidity about the mid-dorsal region and other signs of spinal caries were discovered; but no swelling of lumbar or inguinal regions could be found; neither was there any tumour of the abdomen. The patient improved somewhat and was discharged from the hospital on December 21.

Patient was readmitted to the hospital on February 16, 1892, under the care of Mr. Rouse. He complained that he had had pain about his back and legs, ever since he had left the hospital. He also said that he had been gradually getting weaker. Patient seemed to be in fair general health.

Temperature: Normal.

Urine: Normal.

Spine: Very rigid throughout its length. No tenderness or deformity.

Abdomen: A little increased resistance on the left side, but no definite swelling discovered.

Pelvis: Normal.

Legs: A good deal of weakness. No paralysis. Anæsthesia of left gluteal and inguinal regions and of left side of scrotum.

For some time, patient complained of great weakness and lassitude and of considerable pain. On March 3, patient's temperature rose to 102° F. After this date, the temperature never again fell to normal, always rising to about 102° F. at night and falling to 100° F. in the morning.

On March 10, a swelling was discovered in the left side of the spine in the lumbar region. This swelling fluctuated, but did not pulsate.

The case was seen by Dr. Dickinson, who, finding many of the physical signs of empyema present in the chest, considered that the tumour was an empyema pointing in the lumbar region. Operation was decided on, but for some reason nothing was done.

On March 12, patient awoke about 2.40 a.m. and became noisy and convulsed. After a few minutes, he improved, but shortly afterwards he had a sudden attack of dyspnœa and died at 3.20 a.m.

Post-mortem Examination.

Thin man. Rigor mortis present. No œdema of legs. Swelling in the back, below the last rib, on the left side. Costal cartilages beginning to calcify.

Thorax.

Pleura.—Right, normal; left, adhesions at apex. Quite full of blood and clot. Projecting into the left pleural sac, through the left leaflet of the diaphragm, was an aneurysm arising from the abdominal aorta.

Lungs.—Right, healthy; left, completely collapsed.

Pericardium.—Two layers adherent over small area covering part of right ventricle.

Nothing else of interest in thorax.

Abdomen.

Aneurysm of abdominal aorta, arising from the posterior aspect of the vessel, just below the diaphragm and above the cœliac axis. Sac about the size of a child's head, communicating with the aorta by means of an orifice as large as a florin. The aneurysm contained but little clot. It had passed to the left of the spine and had deeply eroded the bodies of the lumbar vertebræ on the left side, leaving the intervertebral discs almost intact. The aneurysm had pressed on the left kidney and the last rib on the left side, and lay close under the skin of the back. It had not leaked at all into the abdominal cavity. The whole of the rest of the aorta was quite healthy. The capsule of the left kidney was somewhat adherent.

Nothing else of an abnormal character was found.

CASE XXVI.

The patient, a man aged twenty-nine years, an engineer by occupation, was admitted to the hospital on March 1, 1894, under the care of Mr. Rouse.

Patient had had gonorrhœa ten years before admission to hospital. He denied having had syphilis. His general health had been good. He had lived in Egypt and Gibraltar for five years. In August, 1893, the patient had suffered from 'some nervous disease,' with pains in the back and limbs, due to his having been 'exposed to draughts.' He was ill for five weeks. Patient thought that he had strained himself badly over a stiff machine at the end of 1893. A month before patient came to hospital, he noticed a painful pulsating swelling in the abdomen, about the size of a walnut, rather to the right and midway between the umbilicus and pubes.

On Admission.—Fairly healthy-looking man with sallow complexion.

There was a pulsating expansile swelling, about the size of a cricket-ball, in the umbilical and hypogastric regions. No bruit was heard. The tumour came forward, and at its lower part seemed to be immediately behind the abdominal wall. There was some percussion resonance above the tumour, and no absolute dulness anywhere. There was still some chronic pain in the upper gluteal regions.

The patient was treated with iodides and restricted fluids. On March 2, the tumour was about 15 inches in circumference. On March 6, the aneurysm suddenly burst, and the patient died in a few minutes.

Post-mortem Examination.

Well-built, fairly muscular man, though somewhat wasted. Height. 5 feet 7½ inches. Skin blanched. Rigor mortis marked.

Abdomen.—Retracted, with some discoloration of skin.

Peritoneal cavity contained very large quantity of firm, dark blood-clot. This blood came from a ruptured aneurysm of the abdominal aorta.

The aneurysm, which was the size of a large orange, occupied the lowest 2½ inches of the aorta and the whole of the right common iliac artery. The aneurysm was chiefly, though not entirely, of the saccular type, the whole circumference of the aorta being dilated. The greater part of the tumour, however, was in front of the vessel with which it communicated by means of a wide mouth. There was a transverse rupture, more than ½ inch in length, opening straight into the peritoneal cavity, through the mesentery which was adherent to the aneurysm just above the brim of the pelvis. The wall of the sac was, for the most part, extremely thin. The walls of the whole aorta and the large vessels were also very thin, but remarkably smooth internally. There was almost no atheroma. Microscopical examination of the large vessels showed no fatty or other degeneration.

No erosion of the spine.

Liver.—Healthy, except for a small caseous nodule on the upper surface of the left lobe.

The **heart** was small.

All other organs normal.

CASE XXVII.

The patient, a married woman aged thirty years, was admitted to hospital on December 11, 1893, under the care of Dr. Cavafy. With the exception of an attack of rheumatic fever twelve years previously, she had always had good health.

On December 8, the woman shivered, had severe headache, vomited and had sharp pain low down in the right side of the chest. Since that date, she had been somewhat delirious and had had frequent attacks of vomiting and shiverings.

On Admission.—Tongue plastered, face flushed. Temperature, 102·5° F. Pulse small and feeble (98). Bowels constipated. Urine: specific gravity, 1·018. Trace of albumin. Patient breathed cautiously from pain in the right axillary base, as if from pleurisy, although no friction sounds could be heard. Temperature, until the fourth day after admission remained steady at 102·5° F. After that, her temperature stood at 99° to 101° F. till the day of her death. Bowels remained constipated; vomiting was a persistent symptom; but after the first day pain was felt only in the right loin after moving or vomiting.

Abdomen was slightly distended, but was not palpated very thoroughly; since there was a suspicion of enteric fever.

December 17.—Practically no pain. Tongue coated. Temperature elevated. There was more resistance than normal deep down in epigastric and umbilical regions. Definite pulsation to right of middle line, giving the impression that the abdominal aorta was pushed forwards by lordosis of the spinal column.

Until *December* 25, the patient's condition improved slightly, but on that day vomiting began again.

December 26.—Patient complained of catching pain about the base of the chest in front and in the lower axillary region of the right side. Her breathing was again like that found in pleuritis. On light percussion of the dorsal spine, she complained of much tenderness.

December 27.—Patient became suddenly collapsed; the pulse became imperceptible, the face ashy pale, and she bit her tongue during a sort of clonic convulsion. A consultation was held, but it was thought undesirable to perform laparotomy, although it seemed probable that there was internal hæmorrhage (as was suggested by Mr. Dent, chiefly on account of the sudden access of pain preceding the collapse) or that some collection of pus had ruptured. The patient died a few hours afterwards. The case was treated throughout with the care usually bestowed on cases of enteric fever.

Post-mortem Examination.

Fairly well-formed body. More than 1 inch of subcutaneous fat on lower abdomen. No external hæmorrhage. No dropsy. Surface blanched.

Thorax.

Small quantity of blood-stained fluid in right pleural cavity.

Lungs small and emphysematous. Lower lobes, especially right, crepitated imperfectly.

Heart.—Muscle extremely soft, otherwise healthy.

Three hæmorrhages in thorax, unconnected with that in the abdomen :

1. Beneath the pleura, close to the right of the spine and over the eighth and ninth ribs, was a recent clot weighing some ounces.

2. Beneath the pleura, in the first and second intercostal spaces of the right side, near the sternum and extending behind it, was a larger mass of clot.

3. At the base of the heart, on the left side, between the pericardium and pleura and extending to the top of the aorta, was a considerable mass of clot partly decolourized and inclined to be laminated.

The source of these hæmorrhages was not discovered. They were not in connection with any aneurysm or rupture of a large vessel.

Abdomen.

Behind the peritoneum on the right side, was a very extensive extravasation of blood in the form of a solid mass of blood-clot. It extended from the lower border of the liver to the limit of the peritoneum at the back of the rectum, and then turned forwards in front of the peritoneum towards Poupart's ligament. This extravasation covered the front and part of the left side of the spine in the lumbar region, but did not further involve the left side of the abdomen. Nowhere did it occupy the peritoneal cavity. The clot was solid, but apparently of recent formation. The hæmorrhages had come from a ruptured aneurysmal dilatation of the abdominal aorta. The aneurysm occupied the lower 2½ inches of the aorta and the greater part of the left common iliac artery, forming a not very prominent tumour bulging in front and to the left. The rupture was on the right side at the back, immediately above the bifurcation. It measured ¾ inch vertically. The aneurysm was lined by old adherent clot; except where the clot adhered the lung was smooth.

Immediately below the orifices of the renal arteries, was another aneurysm of saccular shape. It was solid with old clot, and projected from the front of the aorta as a rounded tumour about the size of a walnut. On the left renal artery, close to the kidney, was a lobulated aneurysm the size of a hazel-nut. It communicated with the artery by a very small orifice, 1 inch from the kidney. The artery was quite pervious. There was also a small aneurysm of the superior mesenteric artery. All the large arteries were narrow, and their walls were remarkably thin. They were quite elastic, and perfectly smooth internally. They were, however, soft and could be easily indented with the finger-nail, and the intima could be easily stripped off them.

Microscopically, there was no fatty or other degeneration of the large arteries.

Liver.—Extremely soft, though not very pale.

Spleen.—Pale and soft.

Kidneys.—Very pale and soft.

Uterus.—Larger than normal, with loose clot in its cavity.

CASE XXVIII.

The patient, a man aged forty-nine years, a printer by occupation, was admitted to the hospital on April 28, 1897, under the care of Dr. Penrose. Patient had had much domestic worry until two years previous to his admission. His health had been generally good. His habits had been very active. Consumption of alcohol moderate. Syphilis denied. Family history presented no points of interest. Early in the winter, patient had noticed that his right leg easily became cold and numbed. Three months previous to his admission, patient had felt severe pain in his right hip, shooting down to the back of his leg and knee. Both hips had become swollen, swelling of the right leg having come on with pain. There had been pain in the left side of the chest after meals. No vomiting, no shortness of breath. Pain had been very acute ; worse at night and on exertion.

On Admission.—Dilated capillaries on face.

Appetite bad. Bowels constipated. Tongue clean. Pulse 96. Urine : specific gravity, 1·010. No albumin.

Heart : Sounds distant, but normal. Apex-beat not felt.

Lungs : Nothing abnormal found.

Abdomen : Much resistance to examination. Tenderness on pressure, with pain across lower part of abdomen and in right flank, radiating to right testis. Right rectus kept very rigid. Indefinite mass felt in right iliac fossa.

No marked tenderness along sciatic nerve. Œdema of both legs.

After patient had been in hospital a short time he was examined under an anæsthetic, but nothing definite could be made out. Some time afterwards, the indefinite mass in the right iliac fossa became a distinct tumour with well-marked pulsation, which slowly increased in size. The case was regarded as one of malignant disease.

The patient remained for some time in much the same condition, suffering great pain, then his right leg became enormously swollen. He died quite quietly, after having been unconscious for two hours, at 2.30 p.m. on August 8.

Post-mortem Examination.

Only a partial examination was allowed.

Right leg œdematous.

On the abdomen being opened, a large aneurysm of the abdominal aorta was found. The aneurysm filled nearly one half of the abdominal cavity, extending from just below the liver to the right inguinal region. It reached the right flank, and had displaced the aorta to the left. The orifice of the sac had a diameter of four fingers, and was situated 1 inch above the bifurcation of the aorta. The aneurysm was false, and had eroded several vertebræ. The sac had lifted the psoas muscle, and had displaced it outwards. The right kidney was displaced upwards and to the left, the ureter running across the sac of the aneurysm. The cæcum and the small intestines were displaced upwards and to the left.

The clot in the sac was considerably laminated.

The aorta was markedly atheromatous.

There was a small fusiform dilatation of the left popliteal artery at its upper and back part. This artery was very atheromatous and, at one point, contained some adherent clot.

Case XXIX.

The patient, a man aged twenty-eight years, a labourer by occupation, was admitted to the hospital on September 14, 1897, under the care of Dr. Ewart.

There was nothing of interest in the patient's personal or family history. Consumption of alcohol moderate. Syphilis denied.

Eleven weeks before admission, the patient began to suffer pain, recurring every two or three days, 'in the muscles along the back of the right leg from hip to ankle.' Shortly afterwards, he had had pain of the same character in the right side of the sacrum. The pain was sharp in character, beginning at the hip and extending down the leg. It lasted for about three days at a time. The left leg had not been affected. Patient had noticed a tumour on the left side of the abdomen, about seven months before admission, and one on the right side about one month before admission. Bowels very constipated for past three months. Nothing abnormal about the fæces. Had been losing flesh for some time.

On Admission.—Pale, emaciated man.

Chest: Nothing of interest.

Abdomen: Several small indefinite masses or nodules, varying from size of pea to that of walnut, scattered about in abdominal wall—the tumours mentioned above.

Muscles rigid, but liver seemed to extend to below level of umbilicus. Tenderness in right iliac fossa, but nothing definite felt. No ascites. No tenderness along course of sciatic nerve. No jaundice.

Right knee-jerk deficient. Urine: Normal. Fæces: Normal in colour.

Patient vomited every morning from August 9 to September 1, otherwise there was no change. There was marked improvement from September 1 to September 6. On the 6th, patient felt quite comfortable. He died suddenly on November 23.

Post-mortem Examination.

Body well nourished. No œdema. Abdomen not distended.

Thorax.

Half a pint of clear fluid in each pleural cavity. Slight adhesions on anterior surfaces of both lungs.

Lungs.—Lowest lobe of the right lung completely collapsed, owing to pressure of abdominal aneurysm and of fluid.

Heart.—Fatty deposit and infiltration. Slight leaking of aortic valves.

Pericardium.—Slightly adherent to right pleura in front.

Aorta.—Atheromatous, especially in abdominal part of course.

Abdomen.

Large amount of blood-stained fluid and clot in abdominal cavity. Most of the clot was at under surface of liver where aneurysm had burst. A large saccular aneurysm of the abdominal aorta was found. This had its mouth—size of florin—about the orifice of right renal artery. This artery was not affected, but was simply displaced by the aneurysm. The sac had leaked, and, consequently, a large amount of blood had been escaping for some time into the peri-renal tissue. The sac itself contained hardly any laminated or other clot. The peri-renal blood-tumour extended from the liver, to which it was firmly adherent, down to the pelvis. It had involved the right kidney and ureter, both of which were completely surrounded by clot. This tumour had burst, by a small hole the size of a sixpenny piece, just at the extreme right border of the liver. The clot in this secondary tumour was not laminated, but was also not absolutely recent. Some blood had been effused into the psoas muscle, but the vertebræ were unaffected and not carious. The true sac of the aneurysm had a diameter either way of about 4 inches. It extended chiefly behind and to right of aorta, but also bulged to left of that vessel.

The inferior vena cava was stretched over the peri-renal tumour and about 3 inches from liver was thrombosed and fibrotic. All organs anæmic.

Right ureter involved in peri-renal hæmorrhage, thickened and dilated.

CASE XXX.

Man, aged seventy-four years, brought into hospital dead, on May 23, 1901.

Post-mortem Examination.

Stout body; rigor mortis present. No marks of external violence.

Thorax.

Respiratory Organs.—Nothing of interest. Changes due to old age and failing heart.

Heart. — Dilatation and hypertrophy. Scattered fibrous patches in heart wall. Aortic incompetence, and marked calcareous atheroma of aortic and mitral valves causing mitral obstruction.

Coronary Arteries.—Almost occluded by atheroma at commencement. Clotting on atheromatous plates.

Aorta.—Excessively atheromatous throughout its whole length. Soft patches as well as calcareous plates.

Abdomen.

Just above the bifurcation of the aorta, there was an aneurysmal pouch on the posterior wall filled with old clot. Dissecting aneurysm of right common iliac artery. Extensive atheroma of both common iliac arteries. Most of the abdominal branches of aorta thickened and rigid. Other organs presented changes due to cardiac failure. Carotid, vertebral and cerebral arteries all extremely atheromatous.

Case XXXI.

The patient, a man aged thirty-one years, a labourer by occupation, was admitted to the hospital on March 31, 1904. under the care of Dr. Rolleston. The patient had served in the army for eleven years, having been discharged sixteen months before he was admitted to the hospital. He had served in India for five years, during which time he had never had dysentery or malaria, but he had suffered from 'ague, every other day,' for some weeks after his return to this country. The patient had contracted syphilis while in India in 1897. He was treated in a hospital for 'sore,' for one month. He had been in the habit of taking alcohol in moderation. The patient stated that he had had pleurisy of the left side in 1895. There was nothing of interest in his family history. Just a year before admission, the patient noticed pain, for the first time, 'in the lower part of his backbone.' He described it as 'a constant gnawing pain.' He had to relinquish his work in consequence of the pain, which gradually got worse up to May, 1903. In June, 1903, the case was seen by Dr. H. M. Cooper, of Hampton-on-Thames, and by Dr. Frank Tyndale, R.A.M.C., who found profound dulness all over the right side of the chest. Paracentesis thoracis was performed and a quantity of blood-stained fluid was drawn off. After this, the patient gradually got better and, in August, he returned to his work. The patient continued to work till about three and a half weeks before his admission to hospital, when a gradual return of the pain obliged him to give up his employment. The patient described the pain as ' shooting and travelling ' round his body and said that, during the week before his admission to hospital, it had come ' round and through ' to the right side of the abdomen. During the fortnight previous to his admission, the pain had occasionally gone to the testicles, ' drawing up ' the right. The pain was worst at night. ' It hurt most when he turned about.' He could not walk because of the pain, which was also increased on his taking a deep breath. The pain was not associated with any nausea, vomiting, irregularity of the bowels or abnormality in micturition. There had never been any hæmorrhage or gravel.

On Admission.—Fairly well-nourished man. Limbs rather flabby from recent loss of flesh.

The knee-jerks were exaggerated. The upper part of the dorsal spine curved a little towards the right, while there was a slight curvature of the lower dorsal and upper lumbar vertebræ having its convexity towards the opposite direction—*i.e.*, towards the left. There was no tenderness over the vertebral column. No pain on jarring head or heels, but on patient jumping off a stool 8 inches high, there was pain in the back and right side. The patient could move and stoop fairly freely. Nothing else of an abnormal character was found. Examination with X rays gave absolutely negative results. The patient was treated with iodides and gradually improved. He was discharged on April 19.

The patient was readmitted on July 19, 1904. His symptoms were much the same as they had been in March. He looked tired and worn out. He complained that he had had no sleep for a week. Tongue coated; temperature, 97·2° F.; pulse, 100; respiration, 36.

The patient's general condition was much the same as it had been in March, excepting that the cardiac dulness extended 1½ inches to the right of the sternum.

Examination with X rays again gave negative results.

On *August* 14, the abdomen became slightly distended, and from that date onwards the pain was more marked in the right loin than in the lumbar region.

On *August* 21, the patient was seen by Mr. A. M. Sheild, who found no indications for immediate surgical treatment.

On *August* 25, the patient died somewhat suddenly with symptoms of internal hæmorrhage.

Note.—The condition had been diagnosed as aneurysm of the descending portion of the thoracic aorta, before the patient died, but the symptoms were so obscure that, at one period of his stay in hospital, he narrowly escaped being dismissed as a malingerer.

Post-mortem Examination.

Fairly well-nourished body. The skin showed some brown pigmentation, chiefly in the axillary folds. Muscles flabby. No signs of syphilis.

Thorax.

Pleura.—Fairly recent adhesions all over right lung, also at apex and over posterior and basal portions of left lung. No effusion.

Lungs.—Both somewhat emphysematous; on section showed slight œdema. Greater part of both lower lobes practically collapsed. Right more affected than left. No tubercle in lungs. Mediastinal glands slightly enlarged. Infra-tracheal glands showed old caseous and calcareous tubercle.

Pericardium.—Normal.

Heart.—Did not appear to be displaced. Right side dilated. Muscle soft and showing striation due to fatty degeneration. Slightly patchy atheroma on aortic valves, otherwise valves normal. Thoracic aorta showed numerous patches of atheroma.

Abdomen.

Peritoneum contained 2 pints (measured) of blood and clot, which had come from a ruptured aneurysm of the aorta. The subperitoneal tissues around the right kidney and behind the cæcum were extensively infiltrated with blood-clot. The aneurysm, which was more or less globular in shape, measured 6½ inches in its long diameter. It had started in the region of the cœliac axis, distending the aorta in all directions but chiefly backwards and to the right. Some atheroma was visible in the wall of the sac. A large rent in the sac was found on the posterior surface, at the level of the upper pole of the right kidney. The sac itself was more or less empty; the lower part was in intimate relation to the spinal column, and had extensively eroded the bodies of the lower three dorsal and first lumbar vertebræ. The intervertebral discs were intact and stood out prominently.

Liver.—Three pounds two ounces. Pale and a little fatty.

Spleen.—Fifteen ounces. Large and diffluent.

Stomach.—Somewhat dilated.

Other organs normal.

No scar on penis.

CASE XXXII.

The patient, a man aged forty-two years, a clerk by occupation, was admitted to hospital on July 5, 1905, under the care of Dr. H. D. Rolleston. Patient was suffering from acute capillary bronchitis. His mental condition was such as to preclude thorough examination, and he died on July 6.

Post-mortem Examination.

Fairly nourished body, showing slight lemon-yellow tinting of skin and slight general œdema. Scattered petechial hæmorrhages. No surgical emphysema.

Thorax.

Small quantity of fluid in both sides of chest, the result of passive effusion. No pleurisy.

Organs of Respiration.—General bronchitis. Nothing affecting the subject of this paper.

Pericardium.—Normal.

Heart.—Both ventricles much dilated and hypertrophied. Both auricles dilated. Heart muscle showed diffuse fibrosis. The mitral valve was thickened and incompetent from dilatation of the ring. The aortic cusps showed advanced sclerosis, one cusp being almost everted; the valve was quite incompetent to the water test and leaked like a sieve. The tricuspid valve was dilated. The pulmonary cusps were normal.

The **Aorta** showed an extreme grade of atheroma with diffuse dilatation of the arch, constituting an aneurysm. The great vessels were also dilated at their commencements. The orifices of the coronary arteries were very atheromatous and narrowed.

Abdomen.

There was a small quantity of ascitic fluid in the abdomen and lymph in the pelvis. At the commencement of the abdominal aorta was a large fusiform aneurysm, partially filled with laminated clot. The aneurysm had deeply eroded the tenth, eleventh and twelfth dorsal and first lumbar vertebræ. It pushed forward the pillars of the diaphragm with the overlying structures and the pancreas. The whole of the abdominal aorta was excessively atheromatous.

Liver.—Weight, 3 pounds 4 ounces. Typically fatty and 'nutmeg.' Bile-passages, gall-bladder and portal vein normal.

Spleen.—Weight, 5 ounces. Capsule opaque and generally thickened. On section, the organ was tough and deeply congested (cardiac).

Pancreas. — Congested and pushed forward by aneurysm. Otherwise normal.

Kidneys.—Congested and tough from chronic venous engorgement.

Adrenals and Bladder.—Normal. Syphilitic scar on glans penis.

Alimentary Canal.—Stomach and intestines deeply congested, also showing subacute catarrh.

Small Gut contained much altered blood-clot. No obvious bleeding-point.

Abdominal Vessels supplying viscera were atheromatous, but showed no aneurysm.

THE END

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